OPERATION AND MAINTENANCE-

LONG TERM PERFORMANCE PLAN

SKINNER LANDFILL SITE
BUTLER COUNTY
WEST CHESTER, OHIO

Prepared for:

Skinner Landfill Work Group
c/o Ben Baker
The Dow Chemical Company
Ashman Center
4520 E. Ashman
Midland, MI 48674

Prepared by:

Earth Tech, Inc.
200 Vine Street
Wilder, KY 41076

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AMP	Air Monitoring Plan
AOC	Administrative Order on Consent
BCDES	Butler County Department of Environmental Services
CLP	Contract Laboratory Program
COD	Chemical Oxygen Demand
Conrail	Consolidated Railroad Corporation
CQA	Construction Quality Assurance
CQAP	Construction Quality Assurance Plan
CRL	Central Regional Laboratory
DNAPLs	Dense Non-Aqueous Phase Liquids
DQOs	Data Quality Objectives
EGTL	Explosive Gas Threshold Limit
FML	Flexible Membrane Liner (Low Density Polyethylene)
FS	Feasibility Study
FSP	Field Sampling Plan
ft	Feet
GIS	Groundwater Interception System
GWMP	Groundwater Monitoring Plan
HASP	Health and Safety Plan
ID	Inner Diameter
LEL	Lower Explosive Limit
LTPP	Long Term Performance Plan
MS	Matrix Spike
MSD	Matrix Spike Duplicate
MSL	Mean Sea Level
NCP	National Contingency Plan
NEI	NEI Laboratories, Inc.
OEPA	Ohio Environmental Protection Agency
PCB	Polychlorinated Biphenyls
PAHs	Polynuclear Aromatic Hydrocarbons
PMP	Performance Monitoring Plan
POTW	Publicly Owned Treatment Works
PPE	Personal Protective Equipment
PRP	Potentially Responsible Party
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
RA	Remedial Action
RD	Remedial Design
RI	Remedial Investigation
ROD	Record of Decision
RPM	Remedial Project Manager
SU	Standard Units
SLWG	Skinner Landfill Work Group

SOP	Standard Operating Procedure
SVE	Soil Vapor Extraction
SVOCs	Semivolatile Organic Compounds
SWMP	Surface Water Monitoring Plan
TAL	Target Analyte List
TCL	Target Compound List
TDS	Total Dissolved Solids
TSS	Total Suspended Solids
USEPA	United States Environmental Protection Agency
VOCs	Volatile Organic Compounds

1.0 OPERATION AND MAINTENANCE PLAN

1.1 INTRODUCTION

This Operation and Maintenance Plan (O&M Plan) was prepared for the Skinner Landfill, West Chester, Ohio. This Plan presents guidelines for the post-construction O&M care of the Skinner Landfill Site. The Plan details control measures, contingency actions, and environmental monitoring to care for the site following implementation of the Remedial Action.

The U.S. EPA performed the final inspection of the RA construction on March 23, 2003. The U.S. EPA approved the O&M LTP Plan on June 30, 2003.

The post-construction O&M monitoring period begins the third quarter of 2003 and extends for a period of 30 years. The following sections describe the operation and maintenance as well as monitoring activities that will be conducted as part of post-closure care.

1.1.1 Regulatory Compliance

Generally post-closure compliance consists of the following:

1. Continue operation and maintenance of the surface water management system and the groundwater interception and monitoring system.

2. Maintain the integrity and effectiveness of the cap system, including making repairs as necessary.

3. Perform quarterly inspections of the landfill cap during each year of the post-construction O&M care period and submit a written summary and a schedule of any actions to be taken to maintain the facility, as required above, to the USEPA and OEPA district office (Dayton) no later than thirty (30) days after the inspection

4. Fulfill all monitoring and reporting requirements in accordance with Consent Decree dated April 2, 2001

1.1.2 Contacts During Post-Construction Operation and Maintenance Period

Emergency Contacts:

Fire Department		911
	Non-emergency	(513) 777-1133
Police		911
	Non-emergency	(513) 777-2231
West Chester Coalition on Skinner Cleanup		(513) 779-4424
Ohio EPA - Emergency Spill Notification		(800) 282-9378
USEPA, Region V		(312) 886-1999
Electrical Contractor (Hilvert & Pope, Inc.)		(513) 825-7685
Pump Supplier (Global Drilling Supply, Inc.)		(513) 671-8700

Project Manager (PM) (O&M Firm)	TBD
Butler County Emergency	(513) 887-3472
Implementor (Skinner Landfill Group Technical Committee Chairperson)	(989) 636-0787

1.2 LANDFILL COVER

The landfill cover consists of approximately 10.5 acres. The landfill cover serves as a cap for the landfill and buried lagoon. The primary components of the landfill cover are (starting from the waste): 6 to 12 inches of intermediate cover, geocomposite gas vent layer, geosynthetic clay layer, 60-mil geomembrane, geocomposite drainage layer, 24 inches of soil cover, and vegetation.

1.2.1 Operation and Maintenance Tasks

This plan provides for inspection and repair of the physical components of the site after closure. The maintenance program includes the following: inspections, final cover repair, vegetation repairs, and security measures. The O&M activities are planned to occur for a 30-year period after construction completion.

1.2.1.1 Inspections

Perform quarterly site inspections to identify areas of final cover subsidence, unstable slopes, areas of final cover soil erosion, sediment buildup in the drainage control system, leachate system outbreaks (or seepage areas), areas of poor vegetation, animal intrusion, gas vent turbine operation, and the identification of miscellaneous items in need of repair or attention. A written report will be prepared by the Project Manager following each inspection and provided to the Implementor within 5 days after completion of the inspection. An example Landfill Cover Inspection Form is provided in Appendix A.

1.2.1.2 Final Cover Repairs

Repair final cover areas that have experienced differential settlement (identified by signs of ponded water) and erosion. Repairs shall include the regrading of the area to restore the area so no ponding of water occurs.

1.2.1.3 Vegetation Repairs

Areas repaired on the final cover will require re-establishment of vegetative cover. In addition to maintaining and establishing a good vegetative growth, periodic mowing (where possible) of the final vegetative cover will occur during the post-construction period. Vegetation repair will include placement of fertilizer, seed and mulch as described in Section 1.2.3.2.

1.2.1.4 Security Measures

Site access is controlled by fencing located around the perimeter of the capped landfill and the groundwater interception system. The site entrances are secured with gates and locks. Quarterly inspections shall include identification of fencing that requires repair or replacement. Repairs will be made as soon as possible after discovery.

1.2.2 Contingency Plans

There are nine occurrences that would result in the need for a corrective measure to be taken. These occurrences include: leachate breakouts, gas migration, fires, explosions, spills, erosion, landfill settlement, vectors, and unstable slopes.

1.2.2.1 Leachate Breakouts

Should a leachate breakout occur, implement the following action plan.

Upon discovery of the leachate breakout, identify and inspect the location. If the breakout is through the final cover, remove the overlying vegetative growth layers, geocomposite drainage layer, geomembrane, GCL and geocomposite gas venting layer to expose the top of the subgrade layer. Carefully remove sufficient quantity of each material to allow reconstruction to occur. Soil, geosynthetics and/or leachate should be containerized, characterized, transported and disposed of in compliance with the appropriate disposal laws and regulations. Restore final cover by deploying the GCL, geomembrane, and geocomposite material; spreading the vegetative cover layer materials and landscaping the final grade surface. Use new geosynthetic materials for the restoration. Tie the replaced materials cleanly into the undisturbed materials, i.e., geocomposite to overlap in-place undisturbed geocomposite to create a homogenous layer as initially installed. Document the leachate breakout and corrective actions taken in the Quarterly Report.

1.2.2.2 Explosive Gas Migration

Upon detection of an explosive gas concentration, which equals or exceeds the explosive gas threshold limit (EGTL) in the gas monitoring probes, implement the following contingency actions. The EGTL is:

- Fifty percent of the lower explosive limit (LEL) at the facility boundary.
- Twenty-five percent of the LEL in on-site structures such as the extraction well manholes, sampling vault box or inspection manholes.
- The LEL is 5 percent methane by volume.

1. Gas monitoring personnel shall verify explosive gas concentrations by immediate retesting.

2. Upon verification of a reading at or above the EGTL, notify the O&M Firm Project Manager (PM).

3. The PM will increase monitoring frequency based on observed conditions in the monitoring gas probes. The PM will determine if additional monitoring such as shallow soil gas vapor probes is warranted or if corrective measures can be implemented. Additional increases above the EGTL or 90 percent of the LEL at the site boundary will indicate an emergency level of gas in the probes.

5. Once the Implementor and the PM determine that an emergency level of gas is present in the probes, the Implementor or the PM will immediately notify the appropriate local public safety aithorities. These will include, but may not be limited to: the local Health Department, Division of Fire, Division of Police, USEPA, and the OEPA Southwest District Office (see Section 1.1.2).

6. The Implementor and the PM will determine whether the frequency of monitoring should be increased and/or whether the monitoring system should be modified to improve detection. Soil gas vapor probing

in the area surrounding the permanent probe location or the original vapor probe will be conducted, when directed by the PM, in an effort to determine the extent of shallow surface migration.

7. Once the extent of shallow surface migration has been determined, the Implementor will develop a corrective action plan (CAP). The CAP may include a recommendation for the installation of additional passive vents. The CAP will be submitted to the USEPA for approval within 30 days of determination of the emergency level of gas present in the probes.

1.2.2.2.1 Building/Structure Locations

Upon detection of explosive gas concentrations which equals or exceeds the EGTL within a building near the landfill, implement the following contingency actions:

1. Verify by retesting.
2. Notify the Implementor.
3. The PM will immediately notify the appropriate local public safety authorities. These will include, but may not be limited to: the Remedial Project Manager, local Fire Department, USEPA, and the OEPA Southwest District Office (see Section 1.1.2).
4. The PM may then expand monitoring procedures for gases within the buildings and/or develop contingency procedures which may include, but are not limited to, any one or a combination of the following:

   a. Installation of permanent gas monitoring probes supplemented with barhole monitoring for combustible gas in the subject area.
   b. Installation of a continuous combustible gas monitor within the structure.
   c. Increase monitoring frequency.
   d. Develop and post evacuation procedures.
   e. Adapt new monitoring procedures.

5. Once the extent of shallow surface migration has been determined, the Implementor willdevelop a corrective action plan (CAP). The CAP will be submitted to the USEPA for approval within 30 days of determination of an emergency level of gas present in the structure.

1.2.2.3 Fires

A fire at the landfill could be present at the surface, such as a grass fire, or within the landfill with the deposited waste burning. Upon detection of a fire, immediately notify Union Township Fire Department, Implementor's PM, USEPA, and OEPA. The fire department shall determine the method to extinguish the fire. In most cases, for fires within the landfill, the burning waste must be removed, separated from the rest of the landfill, and smothered. Vapor-suppressing foam and soil are also possible materials to smother a fire.

1.2.2.4 Explosions

In the event of an explosion, all site personnel will immediately evacuate the site to a safe distance. Notify the USEPA, OEPA, Health Department, and the local fire and police departments (see Section 1.1.2), and summon qualified personnel to determine the nature and cause of the explosion.

1.2.2.5 Spills

To prevent spillage during refueling for construction equipment in repair activities, the refueling should occur over a spill containment area. The area will be constructed with a perimeter dike/berm of sufficientheight to contain potential spills. The containment area will consist of at least one foot of granular material overlying a 40 mil PVC FML and will be constructed with a minimum sump area of 16 square feet. Use earthen material to absorb the spilled product.

If a spill occurs, it must be reported to the USEPA, OEPA, and local authorities. Records of the incident should remain on file and be summarized in the quarterly and annual reports.

1.2.2.6 Erosion and Differential Settlement

Perform corrective maintenance if inspections reveal excessive erosion, surface displacements, irregularities, ponding of surface water, desiccation, or vegetative overgrowth or damage. Eroded areas will require removal of the surrounding loose soil followed by replacement and regrading to provide a uniform grade. For areas exhibiting minor erosion, temporary measures, i.e.; staked straw bales or silt fences may be used to direct surface drainage away from the eroded area or placed across the eroded area to slow water velocity. The eroded areas will be scarified, reseeded, and mulched. Subsided, settled, or areas with ponding requiring repair shall be investigated by qualified personnel to determine the cause of the displacement. Place suitable soil on the affected areas and regrade as required. If investigations reveal that a malfunction of the cover has caused the displacement (e.g., drainage layer failure), repair or replace the defective items and regrade the site. Reseed, fertilize, and mulch any areas lacking vegetation and areas repaired as needed to maintain adequate vegetative cover.

Erosion may occur in and around surface water control structures, which consist of the benches, rock-lined letdowns, drainage swales, culverts, and sedimentation control mechanisms. Perform corrective measures if inspections reveal erosion, displacement of rip-rap, or clogging of parts of the system. Repairs may include regrading, repair, replacement of rip-rap, or revegetation. Use temporary erosion control mechanisms (e.g., erosion matting, ditch checks, silt fencing, etc.) in these disturbed areas until the vegetation is reestablished.

1.2.2.7 Vectors

Conduct inspections quarterly to identify possible signs of animal burrowing. If evidence of burrowing animals is detected, implement response actions. These response actions could include trapping of the animals and relocating them to new locations, spraying the area with repellant solutions that would chase the animals away, and or installing mechanical devices, such as a thumper that pounds the ground which irritates the animals and chases them away. Repair the final grade surface to its original condition.

1.2.2.8 Unstable Slopes

During quarterly inspections, observations of slopes will be conducted to look for signs of instability such as scarps (open cracks) near the top of slopes and/or bulging near the bottom of the slopes. Unstable slopes will require evaluation by a qualified geotechnical engineer. A response plan will be submitted to the USEPA within 30 days of identification of a possible slope stability issue which outlines how the issue will be evaluated. Once the evaluation has been conducted, the Implementor will develop a corrective action plan (CAP). The CAP will be submitted to the USEPA for approval.

1.2.2.9 Water Seepage

Water seepage areas have historically occurred along the west access road. A subsurface interceptor drain was constructed along the east side of the access road to direct the seepage to the groundwater interceptor system.

If seepage occurs along the west access road, record location and time of seepage. If seepage occurs routinely, an investigation will be made to determine possible causes. Once the investigation is completed, the Implementor will develop a corrective action plan (CAP). The CAP will be submitted to the USEPA for approval within 30 days of completion of the investigation.

1.2.3 Construction Procedures for Site Maintenance

The construction procedures addressed in this section are presented to direct cap maintenance and repair personnel. The possible work elements for cap maintenance include: subbase grade shaping, final cover construction, surface water drainage control construction, and gas vent installation.

1.2.3.1 Subbase Grade

Some repairs to the cap may involve excavating beyond the final cover system. In this case, backfilled materials (covered refuse and general earthfill) must be compacted to a suitable density to restore the subbase grade. The top of the material must conform with bottom of liner elevationsand confirmed by a licensed surveyor in the State of Ohio. The location, procedure, and survey information shall be documented and submitted with quarterly and annual report

1.2.3.2 Final Cover

The final cover consists of a geocomposite gas-venting layer, geosynthetic clay liner (GCL), 60-mil textured geomembrane, geocomposite drainage layer, and a 24-inch vegetative cover containing at least 6 inches of topsoil. Upon detection of an eroded slope, or final cover area in need of repair, document its location and determine the extent of the repair. An eroded slope problem usually can be remedied by removing a portion of the 24-inch-thick vegetative cover via backhoe to the bottom of the erosion rill. Replace the soil using low ground pressure construction equipment and light compaction. Reseed the area according to specifications as discussed below.

If a leachate breakout is detected, it is likely that a section of the entire final cover system will need to be removed. Perform the following steps to remove the final cover system:

1. Mark off area to be repaired in the field with stakes or flags. The area should be substantially larger than the actual working area for ease of repair construction.

2. Using equipment appropriate for the area, remove the topsoil layer and stockpile separately.

3. Remove the entire 24-inch-thick vegetative cover. The 12 inches of material atop the geocomposite shall be removed by hand labor or the bucket of the trackhoe. (Be careful not to disturb geosynthetics). No heavy equipment shall operate on the geosynthetics with less than 12 inches of cover.

4. The geosynthetic layers shall be cut one at a time. Begin cutting a minimum of 12 inches within the geosynthetic exposed area to allow for overlap of repair materials.

5. When the gas venting layer is exposed, cut the area in question and the PM representative shall document the appearance of the top of the subgrade.

After excavation of the repair area, and after the subgrade is properly compacted, deploy the geocomposite, used as a gas venting layer, over the finished subgrade and tie to already in-place geocomposite with plastic fasteners. Inspect and remove the top of the finished subgrade for larger stones (greater than 3 inches in any dimension) which may cause damage to the geocomposite.

Place patches of GCL and geomembrane over the repaired area. Patches of GCL and geomembrane shall extend a minimum of 6 inches beyond the repair area. Overlap the GCL over the in-place GCL and extrusion weld the geomembrane to the in-place membrane. Extrusion seams will be completed in accordance with the manufacturer's specifications. Perform seam testing as the seams are completed. Testing shall be in conformance with the CQAP.

Tie the second geocomposite layer, used as a drainage layer, to the in-place geocomposite as described earlier over the geomembrane. Do not travel on the geocomposite with any type of vehicle until a 12-inch thickness of vegetative cover is spread over the geocomposite. Spread the remaining vegetative cover material over the geocomposite using a low ground pressure tracked dozer. Then spread the 6-inch topsoil layer and grade the final surface to prepare for seeding.

Prior to seeding, prepare the topsoil by loosening it to a depth of 2 inches and level. Removeall stone 12 inches or greater in diameter and debris from the topsoil surface as noted in the original design specifications, Section 2247, Part 3.01C. Apply seed, fertilizer, and mulch. Seed will consist of tall Fescue K-31 (80 lbs/ac) combined with "quick-cover" perennial rye grass (80 lbs/ac). Fertilizer shall be 1,000 lb/acre of 12-12-12 mixture.

Mulch can consist of straw or suitable similar material. Place mulch to a loose depth of 1/2-inch to 1 1/2-inch by hand and anchor it with a Krimper or straight discs with serrated edges. Place mulch within 24 hours of seeding. Seed, fertilizer, and mulch may be applied in one application.

1.2.3.3 Surface Water Drainage Control

Maintenance of surface water drainage control will consist of the following:

- Inspections of diversion swales, drainage pipes, culverts, and sediment control devices.

- Periodic cleaning of sediment control devices by removing the silt build-up may be necessary. Where removal of silt manually using hand equipment is not practicable, a rubber-tired backhoe will be utilized for silt removal from sediment control structures.

- If rip-rap lined channels are damaged, the PM shall assess the situation and determine the repair method. If the rip-rap is damaged, consult a design engineer for a permanent solution.

- Inspect for erosion of grassy channels and repair by regrading, and consult a design engineer to determine if rip-rap is necessary in places when erosion occurs frequently.

1.2.3.4 Gas Venting Installation

It may be necessary to install additional gas vents after completion of closure construction as shown on Drawing 2. In order to install a gas vent, remove the 24-inch-thick vegetative cover as discussed in Section 1.2.3.2. When the vegetative cover material is cleared from the geosynthetics, place 1 foot of sand in the repair area. A drilling rig with an 8-inch-diameter auger drill will sit on the adjacent undisturbed final cover and drill in the sand covered area. Drill an 8-inch-diameter borehole through the geosynthetics and extend the hole 2 feet past the bottom of the cap system. Insert a 4-inch-diameter PVC Schedule 80 pipe into the borehole. The pipe shall have 3/8-inch-diameter perforations from the bottom of the pipe up to the gas venting layer. Fill the annulus with 3/4-inch to 1 ½-inch-diameter clean stone to the top of the gas venting layer. Place a layer of geotextile on top of the clean stone to protect the overlying geosynthetics.

After removal of the sand placed previously, install a geomembrane pipe boot around the 4-inch-diameter PVC pipe. (The boot shall be installed by qualified geosynthetic installers). Weld the boot to the geomembrane and secure the boot around the PVC pipe with silicone caulk and a stainless steel clamp. Install drainage layer geocomposite, then backfill with the vegetative cover soil around the PVC pipe as described in Section 1.2.3.2. The PVC pipe shall extend 8 feet above the surface of the final cover system. Install a galvanized metal wind turbine at the top of the pipe.

Wind turbines on top of the gas vents shall be inspected to verify that they are rotating freely. Those that fail to rotate freely should be replaced.

1.2.3.5 Final Cover Repair Testing

The construction quality assurance (CQA) Consultant shall perform the laboratory tests required for repair construction. This will confirm that the materials for the final cover repairs meet the project specifications. Refer to Table 1 for tests and frequencies.

1.2.3.6 QA/QC Plan for Repair Construction

The CQA Consultant shall confirm that any repair construction activities comply with the project specifications. The CQA Consultant is an independent consultant that is responsible for observing and documenting activities related to the quality assurance of the project for the repair of the facility components. The facility components include: foundation (subbase) and final cover system.

The CQA Consultant is responsible for issuing a record of construction report under the seal of a professional engineer registered in the State of Ohio. The CQA Consultant shall be experienced in quality assurance activities for the assigned task. Field representatives shall have specific experience in the installation of items for which they are responsible. Operators of the nuclear moisture/density meter shall be certified in its operation and use. The PM may choose to request the presence of an OEPA or USEPA representative during all repair construction.

The CQA Consultant shall observe and document the activities of the contractor in sufficient detail and with sufficient continuity to provide a high level of confidence that the work complies with the design drawings and documents. In addition, the CQA Consultant shall perform and repeat tests, as necessary, to provide a high degree of certainty that the physical/mechanical characteristics of each item covered under this plan meet or exceed project specifications.

The CQA Consultant shall issue a report of repair activities. This report shall include, at a minimum, visual observations and test results.

The CQA Consultant is required to inform the PM and contractor, in a timely manner, of any difference of the CQA Consultant's interpretation of the plans and documents from the contractor's interpretation as soon as they come to the CQA Consultant's attention.

Testing during repair construction of the geomembrane layer shall consist of continuous nondestructive seam testing, destructive seam testing every 500 feet of weld, and field seam trial welds every 4 hours. Specific details on these test procedures/methods and frequencies are discussed in the Construction Quality Assurance Plan.

Verify final cover system grades through surveying. Surveying shall be completed by or under the direction of a licensed surveyor registered in the State of Ohio.

If, through the field testing process, it is found that the project specifications are not met, the CQA Consultant shall immediately determine the extent and nature of the deficiency. The CQA Consultant shall schedule appropriate retests after reworking, repairing, or replacing the deficient area(s). If, after repeated attempts to correct a deficiency, a project specification cannot be met, the CQA Consultant shall inform the PM. The CQA Consultant and the PM then shall determine what modifications need to be made in materials, design, or construction technique in order to meet project standards. Retests shall be performed to confirm that any deficiency is corrected before additional work in that area occurs.

If repair construction difficulties arise, the contingency plan to respond to this situation would begin with a meeting to discuss the situation. This meeting would involve the PM, the CQA Consultant, and the construction contractor. The purpose of the meeting is to define the problem and resolve it such that repair work can continue.

1.2.3.7 Records of Construction

As part of repairs to the final cover system, prepare reports to record the quality control and quality assurance efforts and methods used during repair construction to verify substantial compliance with the design. Reports shall consist of the following:

1. Description of repair construction activities.

2. Recorded survey data which, at a minimum, shall include, base grade elevations, coordinates of the repaired area and final cover elevations at the top of the vegetative cover.

3. Results from material testing of the soils, geocomposite, geomembrane layer, and GCL.

4. Drawings and photographs that depict site construction activities and recorded conditions.

5. A description of any deviation from the design documents, as approved by USEPA and OEPA.

Submit copies of repair documentation to the USEPA, Southwest District Office of the OEPA, in the quarterly reports and annual O&M report.

1.2.4 Technical Specifications For Site Maintenance

This section presents the specifications of the materials used during the closure and equivalent material should be utilized to maintain the facility. The specifications presented below are minimum standards and shall be updated prior to any repair being done so as to incorporate any new technology and potential regulatory changes when appropriate. The specifications are written in accordance with USEPA document USEPA/625/4-91/025 entitled "Design and Construction of RCRA/CERCLA Final Covers."

1.2.4.1 Geosynthetic Clay Layer (GCL)

The GCL used for repair of the final cover system shall conform to the following:

1. Material: New, first quality, bentonite layer sandwiched between a non-woven and woven geotextile.

2. Subgrade preparation: Remove all angular soil particles, such as angular gravel, larger than 1/2-inch in any dimension, as well as grade stakes or hubs. Do not place GCL on a frozen subgrade or in area which has become softened by precipitation, i.e., unconfined compressive strength less than 2,000 psf.

3. GCL shall have values as outlined in Table 2.

1.2.4.2 Geomembrane Layer

The geomembrane used for repair of the final cover system shall conform to the following:

1. Material: New, first-quality, 60-mil low density polyethylene resin.

2. Textured on both sides of the sheet.

3. Physical properties of resin used for extrusion welding shall be the same as those of resin used in manufacture of geomembrane.

4. Geomembrane shall have values as outlined in Table 3.

1.2.4.3 Geocomposite (Geonet with Geotextile)

1. The geocomposite for the gas venting layer shall consist of the geonet and geotextile on both sides.

2. The geocomposite for the drainage layer shall consist of the geonet and geotextile on both sides.

3. Geonet shall be HDPE.

4. Geotextile shall be 6-oz. non-woven polyester heat bonded to geonet.

1.2.4.4 Vegetative Soil Cover Material

1. Material: Soil shall have sufficient fertility to support vegetation and protect geocomposite and geomembrane from damage due to root penetration and frost. It shall be free of debris and rock over 12 inches in diameter. The upper 6 inches of the vegetative soil cover shall be considered the topsoil portion.

2. Placement of vegetative soil cover materials:

    a. Place soil layer material on geocomposite within 30 days of completing conformance testing of geomembrane.

    b. Push soil layer material out over geocomposite ahead of equipment in 12-inch thick lifts, with the upper 6 inches to be considered the topsoil portion.

    c. Place soil layer material on slopes beginning at the low end of the affected area and proceed upslope.

    d. Equipment used to install soil layer material over geocomposite shall have a maximum contact pressure of 5 psi on soil layer material.

3. Thickness: Minimum of 24 inches.

4. Compaction: Soil cover shall be placed with a minimum of compactive effort in order to promote root development and growth of vegetation.

1.2.4.5 Vegetation

The vegetation process for repair of the final cover system shall conform to the following:

1. Seeding: tall fescue (80 lbs/acre) combined with "quick cover" perennial rye grass (80 lbs/acre).

2. Fertilizer: 12-12-12 mixture (1000 lbs/acre).

3. Mulch: straw (120 bales/acre).

1.2.4.6 Gas Vent/Probe Materials

The following materials shall be utilized to repair the gas venting system:

1. Perforated 4-inch-diameter Schedule 80 PVC pipe. Perforations shall be drilled at 3/8-inch-diameter, 4 spaces, 90° apart around pipe, and 4 to 6 inches vertically apart. Rotate perforations 45° continuously.
2. Solid 4-inch-diameter Schedule 80 PVC pipe.
3. Manufactured geomembrane boot to fit around 4-inch-diameter pipe (NSC or approved other).

4. Stainless steel clamp bolted around boot and PVC pipe. (Romac Industries Style SSI Stainless- Steel Pipe Repair Clamp or approved other).
5. Stone material: 3/4-inch-diameter to 1 ½-inch-diameter clean crushed stone (AASHTO No. 4 stone or equal).
6. Powdered bentonite (Volclay brand or approved equal).
7. Galvanized metal wind turbine with fitting for 4-inch-diameter pipe.

1.3 GROUNDWATER INTERCEPTION SYSTEM

The groundwater extraction system consists of approximately 770 lineal feet of interceptor trench in three sections and 985 lineal feet of cut-off wall. Located at the low point of the three sections of the interceptor trenches are three extraction wells. Each of the three extraction wells has a submersible pump in it. The pump discharge is tied to a force main that transfers the groundwater from the wells to an existing sanitary sewer which goes to the Butler County POTW for treatment. The pumps have three level controls, one for "pump on", one for "pump off", and one for high level "alarm". If a "pump on" signal is continuous for a predetermined amount of time, an alarm condition will occur. Each pump is connected to a run timer that records the run time. Operation and maintenance of the GIS is outlined in the Operations and Maintenance (O&M) Manual.

All of the pumps will operate independently. They are connected to a main control panel,which is located at the west end of the groundwater interception system. The panel contains run indicator lights for the pumps as well as depth of water in each extraction well with respect to the depth transducer. Additionally, the panel includes a telephone auto dialer that will call a minimum of four predetermined numbers in the event of an alarm situation. The auto dialer will have prerecorded messages indicating the alarm condition and location. The system is designed to be monitored remotely, without the need for routine operator interface.

1.3.1 Operation and Maintenance Tasks

The pumps, valves, settings for the pump control and alarm, flow measurement device, and continuous sampler are the primary components requiring maintenance. During the first 6months of operation, perform the operation and maintenance tasks related to the Groundwater Interception system on a monthly basis. After the first 6 months, perform the O&M activities on a quarterly basis. An example GIS Inspection Form is provided in Appendix A.

The following sections describe the activities and equipment to maintain and monitor during the postclosure care period at the site.

1.3.1.1 Valves

For the two valves located in the sampling vault box, the only maintenance item requiring regular attention will be the operation of the valve. Rotate the valves through the complete range of operation twice during each scheduled O&M activity. Record any problems with the operation of the valve and evaluate the need for further corrective action.

1.3.1.2 Pumps

During scheduled O&M activities, check each of the control levels for pump on, pump off, and alarm to determine if any adjustments are required. Record the run time for the pumps as well as the control levels. If run times are different than design values, evaluate the requirement for an adjustment to the levels. Consult the PM regarding these adjustments. Remove the pumps at each O&M activity to visually inspect them for any material build-up on the pump casing. Remove any material build up on the pump.

Put the entire system through an operation cycle, if possible. This may not be possible due to low water levels.

1.3.1.3 Flow Measurement Device

Take readings at the in-line magnetic flow meter and record on the GIS Inspection Form. Compare recorded flows with the calculated flow values from the pump timers using a typical average flow (gpm) from each pump. Investigate significant variations in the values. These variations could mean meter malfunctions or a possible force main leak. Report the variations and actions taken in the quarterly and annual reports. A spreadsheet shall be maintained for tracking purposes of the volume of water collected from the system.

1.3.1.4 Continuous Sampler

The samples will be collected from the automatic sampler as outlined in the ISCO Sampler section of the O&M Manual. Additionally, the sample quantities will be compared with anticipated sample quantities based on the flow volume. Variations will be investigated and remedied. Report the variations and actions taken in the quarterly and annual reports. During each O&M visit, the automatic samplers operation will be checked to insure it is operational and performing as intended.

1.3.1.5 Extraction Wells

The extraction wells are located at the low points of the collector trenches. Pumps will be placed in the wells to remove liquid from the trench and pump the liquid through the force main. If reduced extraction well efficiency is observed or the well does not operate, clean out of the extraction well will be required.

1.3.1.6 East Fork Mill Creek

Due to the potential for erosion of the East Fork of Mill Creek drainage channel, visual observations of the creek shall be made with particular attention to the creek bank located adjacent to the groundwater interceptor system shall be done during each O&M site visit. Report and document any unusual erosion pattern, flow characteristic or stream alignment noted within the creek or cracks, slumping or movement of the top of the creek bank. All erosion control structures, such as the existing gabion wall located between Stations 5+00 and 7+00, shall be inspected for general integrity. Distressed areas will be addressed by preparing and submitting a corrective action plan within 30 days of notice of condition to the USEPA for review and approval prior to implementation.

1.3.2 Contingency Plans

There are three potential operational problems associated with the GIS: a high groundwater level in the trench, a low groundwater level in the trench, and flow measurement deviating from calculated flow based on the run time indicator. In addition, a discussion of corrective actions for the case of failure in the groundwater interception system is included.

The O&M Manual will be the best source of information for troubleshooting the system. The design engineer is the next best source of information.

1.3.2.1 High Level of Groundwater in Interceptor Trench

A high level of groundwater in the trench will in most cases indicate a pump failure. An alarm is sent to the control panel where the system will activate the auto dialer and make a phone call to a pre-established number. The system continues to run through a list of numbers until it receives the required acknowledgment. During the pre-recorded message, a prompting "beep" will occur. This is the cue to press "9" immediately after the tone to acknowledge the alarm. The system will then indicate that the "alarm is acknowledged" and the call will end.

The person who responds to the alarm will take the spare pump that will be locked in the storage shed to the extraction well where the alarm condition occurred. The first step will be to attempt to operate the current pump manually. If this causes the pump to operate, there is an apparent problem with the electronics. The pump will be left on to attempt to trigger the low level alarm. If an alarm can be triggered, then the problem resides with the pump control system. If no alarm is set off when the level goes below the low level control, there is a problem with the electronics at the well.

If the level controls both function properly, then switch the pumps out and operate the system on manual to see if the system responds. If the system responds then send the pump for repair; if not, a repair personwill be called to check the entire operation at the well location.

1.3.2.2 Low Level of Groundwater in Interceptor Trench

For a low level alarm, exercise a procedure similar to the high level alarm.

1.3.2.3 Flow Measurement Deviations

Perform the following activities to check the flow from each pump:

1. Shut off pumps 2 and 3 and operate pump 1 manually. Inspect the gravity flow manhole to verify that water is flowing from the force main discharge pipe. Prior to and after the shutdown of pump 1, take readings at the flow measurement device and compare to that from pump run timer using the average typical flow rate (gpm) for each pump.

2. If the measurements are significantly different, refer to the flow meter device users manual, included in the O&M Manual, for specific procedures for checking flow meter accuracy.

3. If the measurements agree, proceed to test pumps 2 and 3 in a similar manner.

4. If at any time the numbers (flows) are significantly different, inspect piping at the extraction well location.

5. If no apparent problems are identified, check the water level control settings for proper settings as shown on Table 4 and the O&M Manual. If control settings are not at the correct levels, they may require adjusting and the test rerun. Adjustment of control settings must be approved by the Implementor and documented by modification of Table 4.

6. If water level control settings are at the correct level, pull the pump and inspect it for blockage or build up.

7. If no blockage is identified, reinstall the spare pump and rerun the test.

8. If agreement is not reached, there is an apparent problem with the force main. Contact a design engineer.

1.3.2.4 Failure in Groundwater Interception System

Failure will be indicated if the performance monitoring wells (identified in the LTPP section of this plan) indicate contamination beyond the groundwater interception system location. In the event this occurs, the control settings within the trenches will be adjusted to lower the level of groundwater allowed to remain within the trench.

Piezometers were installed (as part of the LTPP section of this plan) on each side of the trench to test the effectiveness of the trench system. Based on the information gathered and analyzed, the PM will determine what corrective action may be required, if necessary.

1.3.2.5 Corrective Action Implementation Schedule

The corrective action schedule will proceed as follows:

1) After the first trigger level exceedance at a monitor well immediately down-gradient of the slurry wall, a response plan will be developed.

2) After the second consecutive trigger level exceedance in the same monitoring well, the response plan will be implemented and adjusted until there is no further trigger level exceedance.

The response plan may include assessment and/or remedial efforts or adjustment of the trigger levels and must be approved by the USEPA prior to implementation. Anticipating the worst possible failure, the result would be to notify the community of potential contamination of the East Fork of Mill Creek.

1.3.3 Monitoring and Laboratory Testing Procedures for Interceptor Trench Maintenance

Sampling of the effluent from the groundwater interception system will be required as part of the discharge conditions required by BCDES Industrial Discharge Permit (Appendix B). The frequency and analytical parameters have not yet been defined. The O&M Firm will conduct the sampling as required under the discharge permit.

1.3.3.1 Monitoring Tasks

Sample the effluent to the sanitary sewer in accordance with BCDES requirements. Based on the capacity of the sampler and the flow rate from the extraction wells, the timeframe for sample collection will be determined.

1.3.3.2 Data Collection, Laboratory Tests, and Their Interpretation

Samples from the groundwater interception system will be collected at the frequency identified in the BCDES discharge permit. Laboratory analysis will be performed in accordance with the permit to discharge to the Butler County Sanitary Sewer. The analysis will be reported in conformance with the permit.

1.3.3.3 Quality Assurance

The quality assurance is anticipated to be the BCDES personnel taking their own samples and comparing their analysis with the analysis reported.

1.3.3.4 Monitoring Frequency Schedule

Monitoring of the effluent from the collection trench will be performed as required by BCDES. Monitoring results will be reported to BCDES and maintained at the on-site storage shed. The post-construction monitoring of the groundwater will be performed in accordance with the LTPP.

1.3.3.5 Verification Sampling Procedures

No verification samples will be required, as BCDES will be taking verification samples for analysis at varying frequencies.

1.3.4 Technical Documentation for Interceptor Trench Maintenance

1.3.4.1 Daily Operating Logs

These are not applicable as there will not be an operator on-site daily.

1.3.4.2 Laboratory Records

Laboratory records will be required by the BCDES. These records will be reported to USEPA at the same frequency required by the BCDES.

1.3.4.3 Operating Cost Records

Costs will consist of electric used, phone hook-up and any routine monitoring and emergency response costs. Electric and phone costs will be kept on file. Reports will be turned into the USEPA for all monitoring and alarm response situations.

1.4 RECORDKEEPING AND REPORTING

1.4.1 Personnel and Maintenance Records

Visitors to the site, or in the case of contractors, the Field Supervisor or foreman will be required to fill out a site visit report. A site visit report form will be developed by the O&M firm. These reports will be kept on record with the PM. A quarterly summary report will be provided to USEPA that will include this information.

1.4.2 Quarterly/Annual Reports to USEPA and OEPA

The reporting frequency will be predominantly dictated by the frequency of effluent analysis reporting. Due to the low level of activity at the site, it is planned that reports be made quarterly, with an annual summary report.

2.0 LONG TERM PERFORMANCE PLAN

2.1 INTRODUCTION

This section contains the Remedial Action (RA) Long Term Performance Plan (LTPP). The LTPP has been prepared pursuant to the requirements of the Statement of Work (SOW) of the Administrative Order on Consent (AOC) between the United States Environmental Protection Agency (U.S. EPA) and the Skinner Landfill PRP Group (PRPs) dated June 4, 1993.

2.1.1 Applicability

The LTPP addresses the requirement for a groundwater and a surface water monitoring plan for the long-term as called for in the SOW, Sections II, g.1 and g.2, respectively. The monitoring activities for the LTPP start with the first regularly scheduled sampling event after the final RA sampling event.

2.1.2 Scope of Work

This LTPP provides the mechanism to ensure that remedial action meets thelong-term performance standards set forth in the ROD and SOW. Sampling and chemical analysis of groundwater, surface water, and the measurement of groundwater elevations will occur as part of this project following completion of the RA. A description of these field activities is included in the sections that follow.

2.2 GROUNDWATER SAMPLING PLAN

2.2.1 Introduction

The point of compliance for the downgradient groundwater control system will be the line of monitoring wells between the interception system alignment and East Fork of Mill Creek (Drawing 1). Groundwater samples will be collected from 11 monitoring wells located between the groundwater interception system and East Fork of Mill Creek. The wells include GW-06R, GW-07R, GW-58, GW-59, GW-60, GW-61, GW-62A, GW-62B, GW-63, GW-64, and GW-65. The monitoring wells will be sampled quarterly (every three months). The samples will be analyzed for the parameters shown in Tables 7 and 8. However, the implementors may petition U.S. EPA and OEPA to modify the parameter list and sampling frequency based on results of groundwater monitoring conducted on a quarterly basis for two years after completion of the landfill cover and GIS.

Three monitor wells installed during the remedial investigation are located outside the fenced area and include GW-24, GW-26 and GW-30. These three wells will be sampled and tested annually to monitor groundwater quality around the landfill.

Additionally, measurements of water levels and the presence or absence of DNAPLs will be recorded for all existing piezometers, monitoring wells and select gas probes. The elevations will be calculated using the data identified in Table 5. These measurements will be used to evaluate the potentiometric surface and the monitor for DNAPLs in the vicinity of the landfill cover, and interception system.

2.2.2 Sampling Procedure Summary

Groundwater sampling will include the following procedures:

- Pre-sampling Observations and Measurements (Section 2.2.3);
- Sample Collection (Section 2.2.4);
- Sample Preservation and Shipment (Section 2.5.2); and
- Chain-of-Custody control (Section 2.5.3).

Specific procedures, described in the sections that follow, include measurement of water levels; measurement of DNAPLs; purging of wells; field measurements of pH, specific conductance, temperature, sample collection (bottles, preservation and shipping), chain-of-custody control; and field QA/QC procedures. Standard operating procedures (SOPs) for these items are provided in Appendix C.

2.2.3 Pre-Sampling Observations and Measurements

Observations and measurements will be documented in the field notebook prior to sample collection at each monitoring well.

2.2.3.1 Well Integrity

The purpose of monitoring well, piezometer and gas probe integrity is to ensure that the physical integrity of all monitoring points is maintained and that groundwater samples are representative of the groundwater quality of the monitored zone. The sampling team is responsible for assessing the following conditions surrounding the well and noting any potential problems in the field notebook:

- Condition of the surface seal and well locking cover;
- Erosion or ponding of surface water/runoff around the casing;
- Subsidence of the soil materials surrounding the casing;
- Animal or insect activity in or around the casing;
- Obstructions which preclude access to the well;
- Determination if flooding of the well has occurred; and
- Other conditions which affect access or obtaining samples or sample integrity.

The conditions near the casing are important to maintaining the integrity of the well. For example, the surface seal acts to prevent surface water from traveling along the casing to the groundwater. Any damage to the seal, including cracks, must be noted and subsequently corrected. Cracks in the surface seal may allow surface water near the well to seep around the plug and down the casing. Such seepage may allow undesirable mixing of surface water with the groundwater which is to be sampled.

The following observations of the external protective casing are to be noted and recorded by the sampling team in the field notebook:

- Locked external guard casing;
- Animal or insect activity in or on the external guard casing;
- Water in the annular space;
- Severe bends or cracks in the external guard casing;
- Cracks in the concrete pad;
- Blocked weep hole; and
- Other conditions affecting the external guard casing including damage caused by vandalism.

The external guard casing serves to protect the internal well casing. Water in the guard casing is undesirable because it may freeze and crush the PVC well casing. Weep holes in the guard casing must be kept clear to allow water to drain from the guard casing.

The sampling team will visually inspect the PVC well casing before each sampling event. The condition of each well will be noted in the field note book as follows:

- Loose casing;
- Bent or damaged casing;
- Any obstructions in the casing; and
- Condition of the well cap.

The field sampling team will report well integrity discrepancies to the Project Manager. The sampling team must immediately notify the Project Manager by telephone if it is impossible to sample a well, or if the sampling team believes that sample integrity has been compromised.

2.2.3.2 Measurement of Groundwater Elevations

Water-level and depth to well-bottom measurements will be recorded at each monitoring well using a portable electronic measuring tape. Water levels will also be measured in the piezometers and wells listed in Table 5. Measurements will be recorded to an accuracy of $\pm$0.01 feet and will be documented in the field notebook. The measurements will be made relative to a surveyed notch in the top of the PVC casing. The data will be used to calculate the volume of water in the respective well casings and to prepare a potentiometric surface map of the area along the interception system alignment. The water-level and solvent-water tapes and probes will be decontaminated between measurements in accordance with the procedures in Section 2.5.5.

2.2.4 Groundwater Sampling

Purging and sampling equipment will be dedicated to each well to prevent potential cross contamination. Groundwater samples from monitoring wells will be extracted using dedicated submersible electric pumps, positive air displacement pumps, or stainless steel and/or Teflon™ bailers.

2.2.4.1 Well Purging

At least three water column volumes, measured from the top of water to the base of the well, will be purged from each monitoring well prior to sampling and recorded on the Purge Water Calculation Form provided in Appendix B. Purging the wells assures that samples are drawn from the aquifer and not from stagnant water left in the well between sampling events. Stabilization of pH, specific conductance, and temperature during well purging must occur before sampling. Purging will be considered complete when the measurements of samples of consecutive water column volumes agree as follows: pH is $\pm$ 0.1 su, temperature is $\pm$ 1°C, and conductivity is $\pm$ 10 umhos). Purge volume calculations will be as follows: Depth to water will be subtracted from the total well depth, and the result multiplied by a conversion factor for well casing size (0.17 for 2.0-inch I.D. wells). This value will be one water column volume, in gallons, which will be multiplied by three to calculate the minimum required purge volume. A graduated five-gallon bucket will be used to measure the volume purged. Actual purge volumes and start and stop times will be recorded in the Field Notebook. Purge water will be collected and placed in the groundwater interception system using the observation wells.

When a well bails dry during the well purging process, the well will be allowed to recharge overnight. The samples will be collected as soon as sufficient volume has accumulated in the well overnight or a reduced quantity of purge water will be permissible.

2.2.4.2 Sample Collection

Samples will be withdrawn from the monitoring wells with the same equipment used for purging. Sample containers will be filled directly from the bailer (or pump) with minimal air contact and without allowing the sampling equipment to contact the containers.

When testing for the presence or absence of Dense Non-aqueous Phase Liquids (DNAPLs) is to be performed, this testing will be performed prior to sample collection. The presence of DNAPLs will be measured with the interface probe used to measure the wells' water levels. After the presence/absence of the DNAPLs have been determined, the groundwater samples will be collected from the wells.

Groundwater samples for Volatile Organic Compounds (VOC) analysis will be collected first. Care will be taken to slowly fill the sample containers to minimize volatilization of the VOCs. Each VOC sample container will be filled with no head-space in the sample container. After collecting the VOC samples, the sample containers for SVOCs, Pesticides/PCBs, Metals, and Cyanide will be filled, respectively.

Measurements of pH, temperature, and specific conductance will be recorded in the field notebook immediately upon sample collection. The analytical procedures for these field measurements are specified in the field measurement SOPs contained in Appendix C of this document. Field measurements will be made in accordance with proper operating procedures for the equipment.

2.3 SURFACE WATER MONITORING PLAN

2.3.1 Surface Water Monitoring Point Selection Criteria

Monitoring points were chosen to allow impacts from site run-off to be evaluated and include water entering the site upgradient of the landfill, points at and downstream of surface water discharges from the site, and water leaving the site.

2.3.2 Surface Water Monitoring Point Locations

Surface water samples will be collected for analysis from three monitoring points along the East Fork of Mill Creek and three run-off outfall locations (Drawing 1). Sample point SW-52 was chosen to monitor the quality of surface water entering the site. Sample point SW-51 was chosen to monitor surface water runoff and groundwater entering the stream from the landfill cap area. Sample point SW-50 was chosen to monitor surface water leaving the landfill area.

Surface water samples will be collected from SW-50, SW-51, SW-52 and outfall locations SWD-1, SWD-2 and SWD-3 beginning the first quarter following final agency approval of the completed RA components. The samples will be collected quarterly and will be analyzed for parameters found in Tables 7 and 8. However, the Implementer may petition U.S. EPA and OEPA to modify the parameter list and sampling frequency based on results of surface water monitoring conducted on a quarterly basis for two years after completion of the landfill cover and GIS.

2.3.3 Sampling Procedure Summary

Surface water sampling will include the following procedures:

- Pre-sampling Observations and Measurements (Section 2.3.4);
- Sample Collection (Section 2.3.5);
- Sample Preservation and Shipment (Section 2.5.2); and
- Chain-of-Custody control (Section 2.5.3).

2.3.4 Pre-Sampling Observations and Measurements

Observations and measurements will be documented in the field notebook prior to sample collection at each sample point. These observations will include an estimate of stream surface-flow velocity, measurements of pH, specific conductance, and temperature. Visual observations will include any potential impact, such as silting, to the East Fork of Mill Creek. Creek samples will be collected at least 24 hours after a rainfall of 0.10 inch or greater. This is to assure that stream samples are representative of potential impacts by site activities and not excessive sediment loading originating from up stream, off-site sources during significant rainfall events. The time and amount of the most recent rainfall will be verified by measurements obtained from the National Weather Service. The National Weather Service at the Butler County Regional Airport will be contacted for rainfall data.

2.3.5 Sample Collection

Sampling will begin at the sample location most downstream and proceed progressively to the upstream locations. Samples will be collected as near to midstream (or midchannel) as possible. Sampling at midstream may be changed in the field due to practical considerations such as safety and minimizing disturbance of sediment by the sample team walking in the stream. The samples will be collected directly from the stream by immersing the sample bottle with its opening pointed down stream. Collecting substrate and floating debris will be avoided. Sample bottles containing preservative will not be immersed in the stream. Instead, they should be filled with an intermediate laboratory supplied bottle. Samples for field parameters will be collected in a clean sample bottle. Field parameters will not be measured directly in the stream unless a stilling well is installed. Stream flow may affect measurements reported by the instruments.

Samples for VOC analysis will be collected first. Care will be taken to slowly fill the sample containers to prevent volatilization of the VOCs. Each VOC sample container will be filled with no head-space in the sample container. After collecting the VOC samples, the sample containers for SVOCs, Pesticides/PCBs, Metals, and Cyanide will be filled, respectively.

Measurements of pH, temperature, specific conductance, and dissolved oxygen will be recorded in the field notebook immediately upon sample collection. The analytical procedures for these field measurements are specified in the field measurement SOPs contained in Appendix A of this document. Field measurements will be made in accordance with proper operating procedures for the equipment.

2.4 GENERAL FIELD PROCEDURES

2.4.1 Sample Preparation

As each sample is collected in the field, it will be placed in a labeled sample bottle with the appropriate chemical preservatives and stored in an iced cooler. Chain-of-custody documents will be prepared for all samples, which will be shipped to the laboratory in accordance with Section 2.4.3 of this document . Since multiple analyses will be required, different types of containers and preservatives will be necessary. The laboratory will supply sample containers and preservatives. Containers for collecting samples for VOC analysis will be filled to slightly more than full before the cap is placed on the container to ensure that there is no head space or loss of VOCs from the sample. The number and frequency of the trip blanks, rinsate samples, duplicate samples, matrix spike and matrix spike duplicates are specified in Table 6 of this section.

2.4.2 Sample Bottle Preparation and Sample Preservation

Appropriate sample containers and preservatives are presented in Table 10. Samples requiring preservatives shall be preserved in the field with the appropriate reagents supplied by the laboratory. All sample bottles will be certified as precleaned. All sample bottles provided by the laboratory willbe in accordance with current U.S. EPA guidelines (i.e., Specifications and Guidance for Obtaining Contaminant Free Sample Containers, April 1992).

2.4.3 Storage and Shipping

Samples that will be shipped to the laboratory for analysis will be prepared for shipment using the following procedures:

- Tighten each sample bottle lid hand tight. Place custody tape over the lid and apply the sample label;
- Place packing material (approximately 3") in the bottom of a waterproof cooler;
- Seal bottles in clear plastic bags and place them in a cooler in such a way that they do not touch;
- Place pre-cooled blue ice in plastic bags (minimum of 3) and arrange them in the cooler around the bottles;
- Fill the cooler with the sample bottles and packing material;
- Place the completed paperwork (i.e., chain-of-custody forms) in plastic bags and tape them to the inside of the cooler lid;
- Tape the cooler drain shut (if the cooler has a drain);
- Close the cooler and secure the lid by taping the cooler completely around the outside withstrapping tape at two locations;
- Place the laboratory address on top of the cooler;
- Place "THIS SIDE UP" labels on all four sides and "FRAGILE" labels on at least two sides of the cooler;
- Affix custody seals on front right and back left corners of the coolers. Cover seal with wide clear tape and strapping tape as appropriate;
- Ship each sample cooler to the laboratory by Federal Express using "PRIORITY OVERNIGHT DELIVERY" to ensure that the samples are received by the laboratory at the specified temperature of 4 degrees C. The samples should also be shipped in accordance with U.S. DOT and International Air Transport Association requirements; and
- Contact the laboratory if shipment is on Friday or the day before a holiday to ensure laboratory personnel are available to receive the shipment on the following day.

All samples will be preserved on the day they are collected and will be shipped within 24 hours of their collection. All samples will be under chain-of-custody procedures from the moment the samples are collected until the samples have been analyzed, the data reported to the U.S. EPA and the samples properly disposed of.

2.4.4 Sample Identification Nomenclature

A sample nomenclature system will be used to permit easy identification of the sample types and sample locations when retrieving data, reviewing analytical results, or performing data manipulations. The system selected for this project will consist of the following:

- The two-letter site code will be "SK";
- The matrix code will be either SW for Surface Water and GW for Groundwater;
- The location number will be a two-digit number unique to the sample location;
- The QA sample description will be either FB for field blank, FD for field duplicate, TB for trip blank, MS for Matrix Spike or MSD for Matrix Spike Duplicate;
- The sampling round will be designated with a three digit number starting with "200" to avoid potential confusion with prior sampling. Note that the "100" series will be utilized during the RA.

For example, a sample with the sample number SK-SW53-200 refers to the Skinner Landfill surface water sample from location SW53 collected during the first sampling event of the LTPP.

2.4.5 Decontamination Procedures

Field personnel will use the following six-step process for decontaminating sample devices prior to using for taking samples:

- Wash sampling equipment in a solution of potable water and non-phosphate detergent;
- Rinse with clean potable water;
- Rinse with hexane (if DNAPLs are present);
- Rinse with methanol (if DNAPLs are present);
- Rinse with organic-free deionized water; and
- Air dry equipment and wrap in aluminum foil if sampling equipment is to be stored or transported.

All decontamination and other investigation and/or sampling-derived liquids will be collected and transported to the groundwater interception system.

2.4.6 Field Quality Assurance/Quality Control

2.4.6.1 Field QC Checks

Field instruments will be calibrated prior to each use or on a scheduled, periodic basis as recommended in the instrument's operation manual. QC checks on potential impacts to precision and accuracy from sample collection will be assessed through collection and analysis of field duplicates and field rinsate samples in accordance with the applicable procedures described in the Long-Term Performance Plan Quality Assurance Project Plan (LTPP QAPP) (Appendix D). Field duplicate samples will be collected at the frequency defined in Table 1 of this document.

QC checks for field measurement of pH, temperature, and specific conductance are limitedto the following: (1) checking the reproducibility of the measurement by obtaining multiple readings on a single sample/standard or location, every 10 measurements and/or (2) by calibration of the instrument at the beginning of the day, at noon, and at the conclusion of the days sampling or measurement effort (or as specified in the equipment manuals). If the reproducibility of the field data is not within $\pm 10\%$ of the original measurement, all samples (if possible) since the last QC check will be remeasured.

2.4.7.2 Preventative Maintenance

The field instruments for this project include pH meters, thermometers, and specific conductance meters. The specific preventive maintenance procedures to be followed for field instruments are those recommended by the manufacturers. Field instruments will be checked and calibrated at the field team's office before they are shipped or carried to the field. These instruments will be checked and calibrated daily before use. Calibration checks of field instruments will be performed as needed daily and will be documented in a log book specifically dedicated to field instrument calibration. Critical spare parts such as probes, electrodes, batteries and standards will be available to the sampling personnel to minimize instrument downtime. Back up instruments will be available or within one-day shipment to avoid delays in the field schedule.

2.5 TESTING PARAMETERS AND SCHEDULE

Watersamples will be analyzed for the parameters specified in Tables 7 and 8 and in accordance with the LTPP QAPP. Sampling will be conducted quarterly (every 3 months) beginning approximately one quarter after final agency approval of the constructed RA components.

2.6 DATA REDUCTION, VALIDATION, AND REPORTING

Raw data from field measurements and sample collection activities will be appropriately recorded in the field log books. These data will be summarized in tabular form for attachment to the project reports. Any further reduction of the data for evaluation purposes in the reports will be documented therein. Chemical data reported by the laboratory will be independently validated per the LTPP QAPP. Each report will include a discussion of the validated laboratory data and results, groundwater potentiometric measurement results, and DNAPL measurement results. A summary table of water level measurements and DNAPL measurements will be included. Also included, will be a potentiometric surface map for the area under the landfill cap and along the trench alignment. Detailed information regarding data reduction, validation, and reporting is presented in the LTPP QAPP.

2.7 CORRECTIVE ACTIONS

Corrective actions must be taken any time a situation develops that threatens data quality. Corrective action may be required if field audits reveal unacceptable deviation from approved procedures. Corrective action may include immediate resampling and/or reanalysis of a few samples, or the cessation of all analyses with the subsequent resampling and/or reanalysis of all samples upon resolution of the problem.

Specific corrective action for field measurements may include the following:

- Repeat the measurement to check the error;

- Check for all proper adjustments for ambient conditions such as temperature;
- Check the batteries;
- Check the calibration and adjust as necessary;
- Replace the instrument or measurement devices; and
- Stop work (if necessary).

Corrective actions during the field LTPP activities may involve:

- Field Team Leader;
- Field Team Members;
- LTPP Task Manager;
- Project Manager;
- PRPs Project Coordinator;
- U.S. EPA Personnel; and/or
- OEPA Personnel.

A QC problem that cannot be solved by immediate corrective action must be thoroughly investigated to determine the extent of the problem and to ensure that all samples affected by the problem are identified and analyzed. If a problem during field LTPP activities cannot be immediately solved, the Field Team Leader shall contact the LTPP Task Manager or Project Manager.

3.0 GROUNDWATER WASTE MONITORING PLAN

3.1 INTRODUCTION

This section is the Remedial Action (RA) Groundwater-Waste Monitoring Plan (GWMP) for the Skinner Landfill Superfund Site, located in West Chester, Butler County, Ohio. The GWMP has been prepared pursuant to the requirements of Section VIII, Paragraph 13, of the Remedial Action Consent Decree entered by Judge Weber on April 2, 2001, between the United States Environmental Protection Agency (U.S. EPA) and the Skinner Landfill Work Group (SLWG). The purpose of this plan is to monitor the elevation of groundwater beneath the landfill cap area with respect to the maximum depth of buried waste.

3.1.1 Scope of Work

This GWMP provides the mechanism to evaluate whether waste material underneath the cap is in contact with site groundwater and whether the landfill cap is affecting groundwater elevations beneath the landfill. The plan provides for quarterly measurements of the groundwater elevation and flow direction for two years (subsequent to the completion of the landfill cap) or until the groundwater data have stabilized for at least four consecutive quarters, whichever is longer. The data derived from the quarterly sampling events, will be used to evaluate whether or not waste material underneath the cap is in contact with site groundwater. The monitoring shall be implemented in conjunction with the quarterly groundwater sampling at the points of compliance to assess effectiveness of the groundwater interception system and the potential need to construct an upgradient groundwater control system.

If, after two years of consecutive monitoring, EPA is not able to make a determination as to whether the elevation of the groundwater is below the waste material under the cap, quarterly monitoring will be conducted for an additional year. If EPA determines that the elevation of the groundwater is incontact with the waste material underneath the cap and may reasonably be expected to remain in contact with the waste material for more than three years after the completion of the groundwater monitoring period, the SLWG will, within 60 days of EPA's determination or some other longer time period agreed to by EPA, submit to EPA a plan and schedule to construct the upgradient groundwater control. If the upgradient groundwater control plan is submitted, it will be incorporated into the O&M Plan.

Measurement of groundwater elevations will occur as part of the baseline measurements and subsequent measurements following completion of the RA. A description of these field activities is included in the sections that follow.

3.2 GROUNDWATER MEASUREMENTS

3.2.1 Introduction

The points to be measured for the GWMP will be the series of 12 piezometers, 15 monitoring wells and 2 gas probes within and around the landfill cap as shown on Drawing 1 of this plan. If the gas probes are not performing properly, these probes may be replaced by constructing piezometers outside the landfill cap footprint.

Measurements of water levels will be recorded for the existing monitor wells, piezometers and 2 gas probes. The elevations will be calculated using the reference elevations data identified in Table 7. These measurements and the baseline measurements will be used to evaluate the potentiometric surface in the vicinity of the landfill cover and interception system.

3.2.2 Measurement of Groundwater Elevations

Water level and depth to well-bottom measurements will be recorded at each piezometer and monitoring well using a portable electronic measuring tape. Measurements will be recorded to an accuracy of $\pm$0.01 feet and will be documented in the field notebook. The measurements will be made relative to a surveyed notch in the top of the PVC casing. The data will be used to prepare a potentiometric surface map in the vicinity of the landfill cap and the area along the downgradient groundwater interception system-alignment.

3.3 GROUNDWATER/DEPTH OF WASTE

The groundwater elevation measurements from the various piezometers and wells will be used to develop a potentiometric surface map that will include the area under the landfill cover and in the vicinity of the collection trench and cut-off wall. Water levels from successive measurement events will be compared to identify any trends in the data. Furthermore, the potentiometric surface elevations will be compared to the elevation of the bottom of waste. The elevation of the bottom of waste was determined during the installation of piezometers P-9 to P-12 and is provided on Table 11. As required by the Consent Decree, up to two full years of groundwater level measurements will be required after completion of the construction ofthe landfill cover, in order to perform the evaluation of groundwater with respect to depth of buried waste.

The data and results of the groundwater depression evaluation will be presented with the quarterly groundwater monitoring results. The results will include a tabulation of data, historical presentation of data using graphs, and potentiometric surface maps. These reports will also include a discussion of data and results.

3.4 GENERAL FIELD PROCEDURES

Refer to Section 2.4 of this document for field procedures.

3.5 SAMPLE PARAMETERS AND SCHEDULE

Groundwater elevations at monitoring wells and piezometers will be measured quarterly (every 3 months) beginning approximately one quarter after final agency approval of the constructed RA components.

3.6 DATA REDUCTION AND REPORTING

Raw data from field measurements will be appropriately recorded in the field log books. These data will be summarized in tabular form for attachment to the project reports. Any further reduction of the data for evaluation purposes in the reports will be documented therein.

3.7 CORRECTIVE ACTIONS

Corrective actions must be taken any time a situation develops that threatens data quality. Corrective action may be required if field audits reveal unacceptable deviation fromapproved procedures and will be addressed in accordance with the LTPP.

TABLES

TABLE 1

SOIL TESTS AND FREQUENCIES
SKINNER LANDFILL

<table>
<tr><td colspan="3">Pre-Construction</td></tr>
<tr><td colspan="2">Test Type (2)</td><td>Test Frequency</td></tr>
<tr><td colspan="2">General Earthfill:
• Moisture-density relationship (standard or modified proctors)
• Grain-size distribution (sieve and hydrometer)
• Atterberg Limits</td><td>1/material type

3/material type

3/material type</td></tr>
<tr><td colspan="3">DURING CONSTRUCTION</td></tr>
<tr><td>Soil Type</td><td>Test(2)</td><td>Frequency</td></tr>
<tr><td>General Earthfill</td><td>Density/Moisture Content</td><td>2 tests/acre/lift(1)</td></tr>
<tr><td colspan="3">NOTES:

(1) Number of tests to be prorated based on area. In no case will there be no density/moisture testing unless repair is less than 50 square feet.

(2) Testing procedure shall use the current ASTM method at time of the repair.</td></tr>
</table>

TABLE 2

GCL SPECIFICATIONS
(Bentomat® DN)
SKINNER LANDFILL

Material Property	Test Method	Test Frequency, ft^2 (m^2)	Certified Values
Bentonite Swell Index [1]	ASTM D5890	1 per 50 tons	24 mL/2g min.
Bentonite Fluid Loss [1]	ASTM D 5891	1 per 50 tons	18 mL max.
Bentonite Mass/Area [2]	ASTM D 5993	40,000 ft^2 (4,000 m^2)	0.75 lb/ft^2 (3.6 kg/m^2)
GCL Grab Strength [3]	ASTM D 4632	200,000 ft^2 (20,000 m^2)	150 lbs (400N)
GCL Peel Strength [3]	ASTM D 4632	40,000 ft^2 (4,000 m^2)	15 lbs (65N)
GCL Index Flux [4]	ASTM D 5887	Weekly	1×10^{-8} m^3/m^2/sec
GCL Permeability [4]	ASTM D 5084	Weekly	5×10^{-9}cm/sec
GCL Hydrated Internal Shear Strength [5]	ASTM D 5321	Periodic	500 psf (24 kPA) typical

NOTES:

1. Bentonite property tests performed at CETCO;s bentonite processing facility before shipment to CETCO's GCL production facilities
2. Bentonite mass/area reported at 0 percent moisture content
3. All tensile testing is performed in the machine direction, with results as minimum average roll values unless otherwise indicated.
4. Index flux and permeability testing with deaired distilled deionized water at 80 psi (551 kPA) cell pressure, 77 psi (531 kPA) headwater pressure and 75 psi (517 kPA) tailwater pressure. Reported value is equivalent to 925 gal/acre/day. This flux value is equivalent to a permeability of 5×10^{-9}cm/sec for typical GCL thickness. This flux value should not be used for equivalency calculations unless the gradients used represent field conditions. A flux test using gradients that represent field conditions must be performed to determine equivalency. The last 20 weekly values prior to the end of the production data of the supplied GCL may be provided.
5. Peak value measured at 200 psf (10kPA) normal stress. Site-specific materials, GCL products, and test conditions must be used to verify internal and interface strength of the proposed design.

TABLE 3

TEXTURED LLDPE GEOMEMBRANE SPECIFICATIONS (60 Mil) SKINNER LANDFILL

Property	Qualifier	Unit	Specified Value
Thickness	minimum Average	mils mils	54 60
Density	minimum	g/cu cm	0.94
Melt Flow Index	maximum	g/10 min.	0.5
Tensile Strength at Break	minimum	lb/in. width	90
Elongation at Break	minimum	%	250
Tear Resistance	minimum	lb	33
Puncture Resistance	minimum	lb	66
Carbon Black Content	range	%	2.0-3.0
Dimensional Stability (each direction)	maximum change	%	± 2

TABLE 4
EXTRACTION WELL CONTROL LEVELS
SKINNER LANDFILL – GROUNDWATER INTERCEPTION SYSTEM

Level Description	Depth from Ground Surface (feet)			Transducer Read Out* (feet)
	Extraction Well			
	1	2	3	
High Level Alarm	6	11.5	12.5	6.5
Pump On	7.5	13	14	5
Pump Off	11.5	17	18	1.00
Low Level Alarm	12	17.5	18.5	0.50
Bottom of Trench	12.5	18	19	0.00
Transducer	12.5	18	19	0.00
Pump Inlet	14	19.5	20	
Bottom of Sump	16	21.5	22	

* Located on LED display at main control panel.

TABLE 5

GROUNDWATER LEVEL REFERENCE ELEVATIONS

	Location	Ground Surface Elevation (MSL-feet)	Top of Casing Elevation (MSL-feet)
RA Piezometers	P-1	685.42	687.65
	P-2	688.54	690.42
	P-3R	691.83	693.69
	P-4	700.32	702.63
	P-5	708.20	710.65
	P-6	707.45	710.59
	P-7	719.08	721.83
	P-8	747.70	749.91
	P-9	760.68	763.90
	P-10	761.34	764.16
	P-11	760.34	762.76
	P-12	743.50	746.17
RA Groundwater Monitoring Wells	GW-58	684.03	686.53
	GW-59	684.35	687.38
	GW-60	689.12	692.38
	GW-61	687.38	690.86
	GW-62A	690.19	692.38
	GW-62B	690.57	693.13
	GW-63	698.87	702.50
	GW-64	700.45	703.88
	GW-65	703.83	706.88
	GW-66	686.82	689.41
RA Gas Probes	GP-6	772.18	774.65
	GP-7	749.83	752.65
RI Groundwater Monitoring Wells	GW-06R	683.89	685.91
	GW-07R	683.46	683.06
	GW-24	693.32	695.21
	GW-26	696.61	698.28
	GW-30	675.63	677.62

MSL – Mean sea level
RA - Remedial Action
RI – Remedial Investigation

TABLE 6

SAMPLE ANALYSIS AND SCHEDULE (5)

Field Activity	Sample Points	No. of Samples	Field Dups.(2)	Field Blanks(2)	MS/MSD (3)	Trip Blanks (4)	Total Samples (1)	Sampling Frequency	Test Parameters
Surface Water (metals filtered and unfiltered)	SW50, 51, 52, SWD-1, 2, 3	6	1	1	1	1	10	Quarterly	Tables 7 and 8
Groundwater (metals filtered and unfiltered)	GW06, 07R, 58, 59, 60, 61, 62A, 62B, 63, 64 and 65	11	2	2	1	2	18	Quarterly	Tables 7 and 8

Notes:
(1) All samples are considered low/medium concentration samples.
(2) One field duplicate and one field blank will be collected every 10 or fewer investigative samples.
(3) MS/MSD consists of extra volume collected for one of the investigative samples. They will be collected at the rate of one for every 20 or fewer investigative samples. (Triple ADDITIONAL volume for VOCs, double ADDITIONAL volume for SVOCs and Pesticides/PCBs).
* - TAL MS and laboratory duplicate analysis must be performed on an aliquot from the original (1 litre) investigative sample container; no extra volume is required.
(4) One trip blank will be included with each shipment of aqueous VOC samples.
(5) Field parameters include temperature, pH, and specific conductance.
(6) TCL, VOC, CRQL; TCL, SVOC, CRQL; TCL, Pesticides and PCBs, CRQL; TAL, CRQL.

TABLE 7

TARGET COMPOUND LIST

		Quantitation Limits (1)
Volatiles	CAS Number	Water (ug/L)
1. Chloromethane	74-87-3	1.0
2. Bromomethane	74-83-9	1.0
3. Vinyl Chloride	75-01-4	1.0
4. Chloroethane	75-00-3	1.0
5. Methylene Chloride	75-09-2	1.0
6. Acetone	67-64-1	1.0
7. Carbon Disulfide	75-15-0	1.0
8. 1,1-Dichloroethene	75-35-4	1.0
9. 1,1-Dichloroethane	75-35-3	1.0
10. 1,2-Dichloroethane (total)	540-59-0	1.0
11. Chloroform	67-66-3	1.0
12. 1,2-Dichloroethane	107-06-2	1.0
13. 2-Butanone	78-93-3	1.0
14. 1,1,1-Trichloroethane	71-55-6	1.0
15. Carbon Tetrachloride	56-23-5	1.0
16. Bromodichloromethane	75-27-4	1.0
17. 1,2-Dichloropropane	78-87-5	1.0
18. cis-1,3-Dichloropropene	10061-01-5	1.0
19. Trichloroethene	79-01-6	1.0
20. Dibromochloromethane	124-48-1	1.0
21. 1,1,2-Trichloroethane	79-00-5	1.0
22. Benzene	71-43-2	1.0
23. trans-1,3-Dichloropropene	10061-02-6	1.0
24. Bromoform	75-25-2	1.0
25. 4-Methyl-2-pentanone	108-10-1	1.0
26. 2-Hexanone	591-78-6	1.0
27. Tetrachloroethene	127-18-4	1.0
28. Toluene	108-88-3	1.0
29. 1,1,2,2-Tetrachloroethane	79-34-5	1.0
30. Chlorobenzene	108-90-7	1.0
31. Ethyl benzene	100-41-4	1.0
32. Styrene	100-42-5	1.0
33. Xylenes (total)	1330-20-7	1.0

TABLE 7 (cont.)

TARGET COMPOUND LIST

		Quantitation Limits (1)	
Semi-volatiles (2, 3)	CAS Number	Water (ug/L)	Soil/Sediment (mg/kg)
34. Phenol	108-95-2	10	330
35. bis(2-Chloroethyl) ether	111-44-4	10	330
36. 2-Chlorophenol	95-57-8	10	330
37. 1,3-Dichlorobenzene	541-73-1	10	330
38. 1,4-Dichlorobenzene	106-46-7	10	330
39. 1,2-Dichlorobenzene	95-50-1	10	330
40. 2-Methylphenol	95-48-7	10	330
41. 2,2'-oxybis-(1-Chlororpropane)#	108-60-1	10	330
42. 4-Methylphenol	106-44-5	10	330
43. N-Nitroso-di-n-dipropylamine	621-64-7	10	330
44. Hexachloroethane	67-72-1	10	330
45. Nitrobenzene	98-95-3	10	330
46. Isophorone	78-59-1	10	330
47. 2-Nitrophenol	88-75-5	10	330
48. 2,4-Dimethylphenol	105-67-9	10	333
49. bis(2-Chloroethoxy) methane	111-91-1	10	330
50. 2,4-Dichlorophenol	120-83-2	10	330
51. 1,2,4-Trichlorobenzene	120-82-1	10	330
52. Naphthalene	91-20-3	10	330
53. 4-Chloroaniline	106-47-8	10	330
54. Hexachlorobutadiene	87-68-3	10	330
55. 4-Chloro-3-methyphenol	59-50-7	10	330
56. 2-Methylynaphthalene	91-57-6	10	330
57. Hexachlorocyclopentadiene	77-47-4	10	330
58. 2,4,6-Trichlorophenol	88-06-2	10	330
59. 2,4,5-Trichlorophenol	95-95-4	25	800
60. 2-Chloronaphthalene	91-58-7	10	330
61. 2-Nitroaniline	88-74-4	25	800
62. Dimethylphthalate	131-11-3	10	330
63. Acenaphthlene	208-96-8	10	330
64. 2,6-Dinitrotoluene	606-20-2	10	330
65. 3-Nitroaniline	99-09-2	50	800
66. Acenaphthene	83-32-9	10	330
67. 2,4-Dinitrophenol	51-28-5	25	800
68. 4-Nitrophenol	100-02-7	25	800
69. Dibenzofuran	132-64-9	10	330
70. 2,4-Dinitrotoluene	121-14-2	10	330
71. Diethylphthalate	84-66-2	10	330
72. 4-Chlorophenyl-phenyl ether	7005-72-3	10	330
73. Fluorene	86-73-7	10	330

TABLE 7 – (Cont.)

TARGET COMPOUND LIST

		Quantitation Limits (1)	
Semi-volatiles (2, 3)	CAS Number	Water (ug/L)	Soil/Sediment (mg/kg)
74. 4-Nitroaniline	100-01-6	25	800
75. 4,6-Dinitro-2-methylphenol	534-52-1	25	800
76. N-Nitrosodiphenylamine	86-30-6	10	330
77. 4-Bromophenyl-phenyl ether	101-55-3	10	330
78. Hexachlorobenzene	118-74-1	10	330
79. Pentachlorophenol	87-86-5	25	800
80. Phenanthrene	85-01-8	10	330
81. Anthracene	120-12-7	10	330
82. Carbazole	86-74-8	10	330
83. Di-n-butyl phthalate	86-74-2	10	330
84. Fluoranthene	206-44-0	10	330
85. Pyrene	129-00-0	10	330
86. Butyl benzyl phthalate	85-68-7	10	330
87. 3,3'-Dichlorobenzidine	91-94-1	10	330
88. Benz(a)anthracene	56-55-3	10	333
89. Chrysene	218-01-9	10	330
90. bis(2-Ethylhexyl)phthalate	117-81-7	10	330
91. Di-n-Octylphthalate	117-84-0	10	330
92. Benzo(b)fluoranthene	205-99-2	10	330
93. Benzo(k)fluoranthene	207-08-9	10	330
94. Benzo(a)pyrene	50-32-8	10	330
95. Indeno(1,2,3-cd)pyrene	193-39-5	10	330
96. Dibenzo(a,h)anthracene	53-70-3	10	330
97. Benzo(g,h,i)perylene	191-24-2	10	330

Previously known by the name bis(2-Chloroisopropyl) ether

(1) Quantitation Limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on dry weight basis, as required by the protocol, will be higher.

TABLE 7 (cont.)

TARGET COMPOUND LIST

		Quantitation Limits (1)	
Pesticides/Aroclors	CAS Number	Water (ug/L)	Soil/Sediment (mg/kg)
98. alpha-BHC	319-84-6	0.05	1.7
99. beta-BHC	319-85-7	0.05	1.7
100. delta-BHC	319-86-8	0.05	1.7
101. gamma-BHC (Lindane)	58-89-9	0.05	1.7
102. Heptachlor	76-44-8	0.05	1.7
103. Aldrin	309-00-2	0.05	1.7
104. Heptachlor epoxide	1024-57-3	0.05	1.7
105. Endosulfan I	959-98-8	0.05	1.7
106. Dieldrin	60-57-1	0.10	3.3
107. 4,4'-DDE	72-55-9	0.10	3.3
108. Endrin	72-20-8	0.10	3.3
109. Endosulfan II	33213-65-9	0.10	3.3
110. 4,4'-DDD	72-54-8	0.10	3.3
111. Endosulfan sulfate	1031-07-8	0.10	3.3
112. 4,4'-DDT	50-29-3	0.10	3.3
113. Methoxychlor	72-43-5	0.50	17.0
114. Endrin ketone	53494-70-5	0.10	3.3
115. Endrin aldehyde	7421-36-3	0.10	3.3
116. alpha-Chlordane	5103-71-9	0.05	1.7
117. gamma-Chlordane	5103-74-2	0.05	1.7
118. Toxaphene	8001-35-2	5.0	170.0
119. AROCLOR-1016	12674-11-2	1.0	33.0
120. AROCLOR-1221	11104-28-2	0.5	67.0
121. AROCLOR-1232	11141-16-5	0.5	33.0
122. AROCLOR-1242	53469-21-9	1.0	33.0
123. AROCLOR-1248	12672-29-6	1.0	33.0
124. AROCLOR-1254	11097-69-1	1.0	33.0
125. AROCLOR-1260	11096-82-5	1.0	33.0

(1) Quantitation Limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on dry weight basis, as required by the protocol, will be higher.

TABLE 8

TARGET ANALYTE LIST

Analyte	Contract Required (1, 2, 3) Detection Limit (ug/L)
Aluminum	200
Antimony	60
Arsenic	10
Barium	200
Beryllium	5
Cadmium	5
Calcium	5000
Chromium	10
Cobalt	50
Copper	25
Iron	100
Lead	3
Magnesium	5000
Manganese	15
Mercury	0.2
Nickel	40
Potassium	5000
Selenium	5
Silver	10
Sodium	5000
Thallium	10
Vanadium	50
Zinc	20
Cyanide	10

(1) Higher detection limits may only be used if the sample concentration exceeds five times the detection limit of the instrument or method in use. The value may be reported even though the instrument or method detection limit may not equal the CRQL. This is illustrated in the example where the value of 220 may be reported even though the instrument detection limit is greater than the CRQL.

For lead:

Method in use = ICP
Instrument Detection Limit (IDL) = 40
Sample Concentration = 220
CRQL = 3

(2) The CRQLs are the instrument detection limits obtained in pure water. The detection limits for samples may be considerably higher depending on the sample matrix.

(3) The CRQLs for soils = 200 times CRQL's for water.

TABLE 9

REVISED MODIFIED TRIGGER LEVELS

Compound	Units	Modified Trigger Limit
Volatile Organic Compounds		
1,1,1-Trichloroethane	ug/l	88
1,1,2,2-Tetrachloroethane	ug/l	107
1,1,2-Trichloroethane	ug/l	418
1,2-Dichloroethane	ug/l	5
1,2-Dichloroethane(total)**	ug/l	70
1,2-Dichloropropane	ug/l	5
2-Butanone	ug/l	7.1
Benzene	ug/l	5
Carbon Tetrachloride	ug/l	5
Chlorobenzene	ug/l	26
Chloroform	ug/l	79
Ethylbenzene	ug/l	62
Styrene	ug/l	56
Tetrachloroethene	ug/l	5
Toluene	ug/l	1000
Trichloroethene	ug/l	5
Vinyl Chloride	ug/l	2
Xylene (total)	ug/l	10000
Semi-Volatile Organics		
1,2,4-Trichlorobenzene	ug/l	77
1,2-Dichlorobenzene	ug/l	11
1,3-Dichlorobenzene	ug/l	600
1,4-Dichlorobenzene	ug/l	75
2,2'-oxybis-(1-Chloropropane)#	ug/l	4360
2,4-Dimethylphenol	ug/l	2120

TABLE 9

REVISED MODIFIED TRIGGER LEVELS

Compound	Units	Modified Trigger Limit
4-Nitrophenol	ug/l	150
Acenaphthene	ug/l	520
Benzo(a)anthracene	ug/l	10
Benzo(a)pyrene	ug/l	10
Benzo(b)fluoranthene	ug/l	10
Benzo(g,h,i)perylene	ug/l	10
Benzo(k)fluoranthene	ug/l	10
bis(2-Chloroethyl)Ether	ug/l	13.6
bis(2-Ethylhexyl)phthalate	ug/l	49
Butylbenzylphthalate	ug/l	10
Chrysene	ug/l	10
Di-n-butylphthalate	ug/l	190
Dibenzo(a,h)anthracene	ug/l	10
Dimethylphthalate	ug/l	73
Fluoranthene	ug/l	10
Hexachloroethane	ug/l	10
Indeno(1,2,3-cd)pyrene	ug/l	10
Isophorone	ug/l	900
Naphthalene	ug/l	44
Nitrobenzene	ug/l	27000
Phenanthrene	ug/l	10
Phenol	ug/l	370
Inorganics		
Antimony	ug/l	60
Arsenic	ug/l	10
Barium	ug/l	1000
Beryllium	ug/l	5

TABLE 9

REVISED MODIFIED TRIGGER LEVELS

Compound	Units	Modified Trigger Limit
Cadmium	ug/l	5
Chromium	ug/l	11
Copper	ug/l	25
Iron	ug/l	5000
Lead	ug/l	4.2
Mercury	ug/l	0.2
Nickel	ug/l	96
Selenium	ug/l	5
Silver	ug/l	10
Thallium	ug/l	40
Zinc	ug/l	86
Cyanide	ug/l	10

Only parameters with existing Table 1 trigger levels were evaluated.
\# Previously known by the name bis(2-Chloroisopropyl)ether.
** Existing trigger for cis isomer is 70 ug/l, trans isomer is 100 ug/l.

TABLE 10

WATER SAMPLE BOTTLES, PRESERVATION AND TECHNICAL HOLDING TIMES

Parameters	Container	Preservative	Technical Holding Time	Amount
TCL Volatiles	40 mL VOA vials	HC1 to pH<2	10 days	2 x 40 mL
TCL Semi-volatiles	1 L amber glass	Cool, 4 degrees C	5 days to extraction 40 days to analysis	2 x 1 L
TCL Pesticides/PCBs	1 L amber glass	Cool, 4 degrees C	5 days to extraction 40 days to analysis	2 x 1 L
TAL Inorganics (unfiltered/filtered)	1 L polyethylene	HCl to pH<2	180 days (except mercury 26 days)	1 L
TAL Cyanide	1 L polyethylene	NaOH to pH>12	12 days	1 L
Dissolved Oxygen - 4500-0G	1 L polyethylene	Cool, 4 degrees C	24 hours	1 L
BOD - EPA 405.1	1 L polyethylene	Cool, 4 degrees C	48 hours	1 L
COD - EPA 410.4	1 L polyethylene	H_2SO_4 to pH<2	28 days	1 L
TSS - EPA 160.2	1 L polyethylene	Cool, 4 degrees C	7 days	1 L
Oil & Grease - EPA 413.1	1 L amber glass	H_2SO_4 to pH<2	28 days	1 L
Ammonia Nitrogen - EPA 350.1	1 L amber glass	H_2SO_4 to pH<2	28 days	1 L
TDS - EPA 160.1	250 ml polyethylene	Cool, 4 degrees C	7 days	250 mL

TABLE 11

BOTTOM OF WASTE ELEVATIONS

Piezometer	Depth to Waste (feet)	Bottom of Waste Elevation (feet)	Baseline Water Elevation (feet) (June 2001)	Water Level Elevation (feet)			
				March 2002	June 2002	Sept. 2002	Dec. 2002
P-9	25	737	745.0	742.63	745.05	744.73	741.83
P-10	30	734	744.5	738.41	738.90	738.13	737.68
P-11	17	745	744.3	734.29	737.30	734.53	733.11
P-12	35	707	713.5	703.27	705.60	704.86	705.72

Shaded water level elevation below elevation of waste.

APPENDIX A

STANDARD FORMS

SKINNER LANDFILL SUPERFUND SITE
LANDFILL COVER
QUARTERLY INSPECTION REPORT

DATE: ____________________ INSPECTOR: ____________________

Subsidence No Issues

Comments: ____________________

Erosion No Issues

Comments: ____________________

____

Sediment Build-Up No Issues

Comments: ____________________

____

____

Leachate/seepage No Issues

Comments: ____________________

____

____

Vegetation No Issues

Comments: ____________________

____

____

Vectors No Issues

Comments: ____________________

____

____

Gas Vents No Issues

Comments: ____________________

____

____

Fence and Gates No Issues

Comments: ____________________

____

SKINNER LANDFILL SUPERFUND SITE
GROUNDWATER INTERCEPTOR SYSTEM

QUARTERLY INSPECTION REPORT

DATE: ____________________ **INSPECTOR:** ____________________

Valves
Comments:____

Pumps	Transducer Reading	Run Time	Removed	Cleaning Needed
	1			
	2			
	3			

Comments:____
____

Flow Meter

Cumulative Pumped________________ (gallons)
Current flow ________________ (gallons per minute)

Comments:____
____
____

Discharge Sample Collected Yes No

Comments:____
____
____

Flow Check Conducted Yes No

Comments:____
____
____
____

APPENDIX B

BCDES SPECIAL WASTEWATER DISCHARGE PERMIT

Butler County
Department
of Environmental
Services

Water • Wastewater •
Solid Waste • Recycling &
Litter Prevention

BCDES

Commissioners:
Courtney E. Combs
Charles R. Furmon
Michael A. Fox

SPECIAL WASTEWATER DISCHARGE PERMIT

March 17, 2003

The Skinner Landfill Site Work Group
c/o The Dow Chemical Company
Attn: Ben Baker
Remediation Leader
The Dow Chemical Company
4520 E. Ashman
Midland, MI 48674

Re: Skinner Landfill Consent Decree
Permit # 150-01
Permit Fee $200.00
Effective Date: 3/11/2003
Expiration Date: 9/30/2003

In accordance with the provisions of the agreement reached with Butler County Department of Environmental Services (hereafter "BCDES") in May 1996, this Special Wastewater Discharge Permit is hereby granted to The Skinner Landfill Site Work Group, c/o The Dow Chemical Company Attn: Ben Baker Remediation Leader 4520 E. Ashman Midland, Michigan 48674 (hereafter called "Permittee") on this 17th day of March, 2003. **This permit supersedes the permit originally issued on 03/11/2003, and is retroactive to 03/11/2003.** Permittee is authorized to discharge into the Butler County Sewer System in a manner approved by BCDES under the following conditions of this draft permit:

BCDES has agreed to accept the groundwater discharge from Skinner Landfill Site, only based on the understanding that a Special Discharge Permit would be issued by BCDES with site-specific conditions for connection, monitoring, compliance, and user fees. BCDES proposes to handle this discharge in a unique way because (a) groundwater is a

Butler County Administrative Center
130 High Street
Hamilton, Ohio 45011
(513) 887-3061
Fax (513) 887-3777
www.butlercountyohio.org/des

prohibited discharge according to the BCDES Sewer Use Rules (hereafter "Rules"), (b) the pollutant concentrations and flows may fluctuate and (c) there is no control or pretreatment system in place. This Draft Special Discharge Permit will be subject to a 14 day public notification process prior to consideration by the Butler County Board of Commissioners.

The permit shall contain special conditions of the discharge and shall expire on September 30, 2003. Subsequent permits shall be effective for up to five (5) years. BCDES will use the sampling vault to collect flow proportional samples. Grab samples will be obtained from the next downstream manhole from the sampling vault. The discharge will have a flow monitoring system. BCDES requires all dischargers to execute a flow monitoring agreement and have an effective O&M and calibration program in place so that BCDES is assured reliable flow data.

The monthly usage fee shall be established at 200% of the standard discharge fee/1000 gallons based on the potentially hazardous content of the waste.

Except as provided in this Special Permit, Permittee shall at all times remain subject to all provisions of the Rules. This Permit does not constitute a waiver by BCDES or the Board of County Commissioners of the right to seek any lawful remedy or penalty for any such violation of this Permit or Rules.

Section 9.6A of the Rules provides that any person who violates a permit condition is subject to a civil penalty in an amount not to exceed $10,000.00 per day of such violation (Section 9.6A). Consequently, should Permittee violate this Special Wastewater Discharge Permit or any Rule, the County, acting through its Director of BCDES, shall have the authority to assess civil penalties of up to $10,000.00 per violation per day. A violation of this permit is subject to such penalties as may be provided by law.

In addition to civil and criminal liability, the Permittee violating this permit, or causing damage to or otherwise materially inhibiting the Upper Mill Creek wastewater disposal system shall be liable to the BCDES for any expense, loss, or damage caused by such violation or discharge. The BCDES shall bill the Permittee for the costs incurred by the BCDES for any cleaning, repair, or replacement work caused by the violation or discharge. Refusal to pay the assessed costs shall constitute a separate violation of Section 9.6B of the Rules.

This permit may be modified by agreement of the Permittee and BCDES in accordance with provisions of the Rules or as lawfully required by the United States EPA, Ohio EPA or agencies thereof. Should BCDES and Permittee be unable to come to terms on a modification of this Permit, BCDES may cancel any remaining term of this Permit upon 180 days notice to Permittee.

Failure on the part of the Permittee to fulfill any of the specified conditions may be sufficient cause for immediate revocation of this permit per Section 5.7 of the Rules. This permit is further subject to termination upon thirty (30) days written notice to the Permittee by an authorized representative of BCDES.

It is the responsibility of the Permittee to submit to an Application for Special Wastewater Discharge Permit to BCDES at least ninety (90) days prior to the expiration date of this permit.

This permit may be assigned or transferred to another discharger per provisions of Section 5.6 of the Rules, which require approval of the Director. Such assignment will not be unreasonably withheld. Notice of changes in the point of discharge, in the number or location of extraction points or other changes that may impact the quality or quantity of the effluent must be provided to and acceptable to BCDES per Section 6.5 of the Rules.

Incidental discharges resultant from monitoring, and/or operation and maintenance of the Skinner Landfill Site as of the effective date of the Special Permit Issuance may be accepted upon notification to BCDES per the Rules.

James A. Parrott

James A. Parrott
Director

SPECIAL PERMIT CONDITIONS

1) Except as otherwise provided in this Special Permit, the Permittee shall comply with the Rules and with the U.S. v Skinner Consent Decree. Where inconsistency exists between the Rules and the Consent Decree, an understanding shall be reached between BCDES and Permittee, with court approval where necessary, as to the terms of this Special Permit before discharges are accepted. In the event of a dispute between the Permittee and BCDES after the Permit is granted, the parties agree to attempt to resolve the dispute first through mediation using a mediator acceptable to both parties, and including U.S. EPA in the mediation if requested by the Permittee.

2) The Permittee shall allow BCDES personnel, upon presentation of their credentials or other documents as may be required by law, to: enter the Skinner Site premises and have access to, inspect, and copy, at reasonable times, any records located at any facility that are deemed necessary by such personnel to determine Permittee's compliance with this Permit. Permittee shall have the right to claim business confidentiality, trade secret, or privileges recognized by state or federal law on the face of any document sought to be copied by BCDES personnel. Should any other person attempt, under the Ohio Public Records Law, to obtain a copy of material from BCDES which Permittee claims to be protected from disclosure, BCDES shall notify Permittee of the request and allow Permittee to defend its claim of entitlement to exclusion before a judge of the Butler County Court of Common Pleas and no material shall be released except in accordance with the final ruling of an Ohio court upon the question. The Permittee shall allow BCDES personnel to inspect at reasonable times any facilities, equipment, practices, or operations regulated or required under this permit; BCDES may sample or monitor, for the purposes of assuring permit compliance, any relevant substances or parameters at any location; and inspect any storage area where pollutants, regulated under this permit, could originate, be stored, or be discharged to the sewer system. Should BCDES be denied access to records it seeks to determine compliance with the terms and conditions of this Permit, then a responsible official of the Permittee shall provide BCDES with an affidavit attesting to Permittee's full and complete compliance with the terms of this Permit under penalty of perjury. Should BCDES be denied access to information it seeks or be denied an acceptable affidavit in lieu of access, BCDES may terminate this Permit upon thirty (30) days prior notice to Permittee.

3) BCDES will conduct regular discharge monitoring to determine that constituents in the effluent from Skinner Landfill Site do not exceed local limits or site-specific limits or pose a threat to the wastewater treatment facility, the collection system, County employees or the receiving stream. The inorganic and organic discharges shall not be in excess of local or site specific limits (see attached maximum discharge limit chart). Should sampling indicate violations of these limits, BCDES reserves the right to suspend the discharge and/or require pretreatment prior to accepting additional flow.

4) Due to the nature and source of the discharge, BCDES will aggressively monitor local limit parameters until the County feels that it has representative data, at which time a normal schedule may be adopted of monthly local limits monitoring. However, BCDES has the right to sample, with or without notice, as frequently as it determines necessary. The costs associated with sampling will be billed back to the discharger along with any surcharge fees associated with high strength acceptable waste. Any prohibited waste in excess of site specific limits will be subject to the enforcement provisions of the Rules and the Enforcement Response Plan. BCDES understands that seasonal variations may have an impact on water quality parameters, and we want to be assured that the concentrations we are given are within the Publicly Owned Treatment Works (POTW's) ability to safely handle.

5) The Permittee shall report to the BCDES any significant changes in location, operational conditions, the quality or quantity of discharges or chemical storage procedures as provided in Section 6.5 of the Rules.

6) The Permittee shall notify the BCDES immediately after Permittee's knowledge of the occurrence of an accidental discharge of substances or slug loads or spills that may enter the public sewer. BCDES should be notified by telephone at (513) 887-3686.

The notification shall include location of discharge, date and time thereof, type of waste, including concentration and estimated volume, and corrective actions taken (Section 6.6A). The Permittee's notification of accidental releases in accordance with this section does not relieve it of other reporting requirements that arise under local, State, or Federal laws or the U.S. v Skinner Consent Decree.

Within 5 days of the verbal notification of a discharge, a complete written report must be submitted detailing the quantity and quality of discharge, reason for discharge, and steps taken to prevent further occurrences.

7) The Permittee shall keep on file at a location of Permittee's choosing, all records, documents, reports, and correspondence pertaining to effluent monitoring, sampling, and chemical analysis made by or prepared for the Permittee. Said records, reports, documents and correspondence shall be kept on file for a minimum of three (3) years.

8) Particular attention should be given to the following: (Note: This section will be utilized to reflect the categorical standards and limits (40 CFR 433) if applicable).

(a) From effective date of the permit through September 30, 2003, the Permittee's effluent wastewater discharged to the County Sewer System shall not exceed the following limits based on flow rates provided in the application.

BCDES Special Permit Limits for Skinner Landfill Site

Skinner Landfill Applicable Parameters	Applicable Limit	Allowable Mass Loading Limits(1) (lbs/day)
TTO	Site Specific	0.53
Arsenic	Local Limit	0.04
Cadmium	Local Limit	0.02
Chromium, Total	Local Limit	0.88
Chromium, Hexavalent	Local Limit	0.13
Copper	Local Limit	0.35
Lead	Local Limit	0.13
Mercury	Local Limit	≤0.00009
Molybdenum	Local Limit	0.17
Nickel	Local Limit	0.31
Selenium	Local Limit	0.03
Silver	Local Limit	0.01
Cyanide, Total	Local Limit	0.03
Zinc	Local Limit	0.25
Ammonia	Local Limit	9.17
BOD_5	Local Limit	366.96
COD	Local Limit	917.40
Oil & Grease	Local Limit	18.35
TSS	Local Limit	229.35

(1) Based upon 11,000 gallons per day discharge rate. The method detection limit (MDL) for mercury is 0.2 ug/l. Ohio EPA defined practical quantification limit (PQL) is 5 times the MDL. To determine compliance with this permit, results below the mdl will be reported as BDL. Results between the MDL and the PQL shall be reported as an analytical result.

9) The conditions for renewal of the permit will be that 90 days prior to expiration of the permit, the Permittee shall provide a analysis of the discharge, including operational schedule and anticipated flows, concentrations and an evaluation of the discharge needs for the following 4 years. Additionally, any anticipated significant operational changes shall be reported at any time there is an anticipated significant change during the course of the agreement.

10) The Permittee must verbally notify BCDES within 24 hours of becoming aware of any violation found in any self-monitoring. BCDES will require the Permittee to re-sample every 30 days until the Permittee's discharge is in compliance with limits established in this permit. In addition, the Permittee must submit all effluent and monitoring well data collected in accordance with the self-monitoring requirements in 40 CFR Part 136 (as applicable) or the analytical requirements approved by U.S. EPA pursuant to the U.S. v. Skinner Consent Decree, as appropriate. This includes any samples the County may split with the Permittee.

11) This permit allows discharge of up to 324,000 gallons per month from the Skinner Landfill Site. Flows greater than 324,000 gallons per month will be assessed peaking surcharges as established in the County's Sewer Rate Resolution 02-1-103, or any subsequent rate schedule. Additionally, due to the nature of this special discharge, any peaking charges are subject to be billed at the 200% standard discharge fee that is established this Special Permit.

Should additional flow need to be discharged from the Skinner Landfill Site, then a letter requesting allocation of additional capacity will need to be sent to the Director. Since groundwater is a prohibited flow except as provided by this Special Permit, then separate approval and agreement will be needed regarding additional ERU allocation.

12) BCDES may make an additional 23 ERUs ("Additional ERU") available for Permitee's use with the understanding that the charges for the 23 ERUs will be paid by Permittee at the rate currently in effect at the time of purchase. It is also required that Permittee will surrender to BCDES one or more Additional ERU(s) assigned to Permittee when the groundwater flow from the Skinner Landfill Site decreases such that each Additional ERU/capacity allocation is no longer needed by Permittee. An Additional ERU will be deemed to be no longer needed after a period of two (2) years in which the peak flow in any one month does not exceed 110% of the additional assigned capacity. For example, if the peak monthly flow in 2004 is 450,000 gallons, then each Additional ERU in excess of that needed for the 495,000 gallon capacity allocation would be considered to be an Additional ERU to be surrendered in 2006. For the purposes of determining the surrender of an Additional ERU, a review will be conducted by BCDES and Permittee in January of each year with a surrender of an Additional ERU, if any, to occur in January two (2) years later. Should data during the intervening two (2) years indicate Permittee's need for the Additional ERU, then a letter requesting deferral of the surrender will be submitted to BCDES. Consent for such deferral will not be unreasonably withheld by BCDES. Notwithstanding the ERU review example provided above, at no time shall the Additional ERU review require the Skinner Landfill Site to surrender any of the original 27 ERUs (324,000 gallons per month) authorized under this permit.

APPENDIX C

STANDARD OPERATING PROCEDURES

APPENDIX C

SOP TABLE OF CONTENTS

SOP-1	Well Purging
SOP-2	Groundwater Sampling
SOP-3	Standard Operating Procedure for the Measurement of Temperature in Water
SOP-4	Standard Operating Procedure for the Field Measurement of pH in Water
SOP-5	Standard Operating Procedure for the Field Measurement of Conductivity in Water
SOP-6	Standard Operating Procedure for the Measurement of Dissolved Oxygen in Water
SOP-7	Surface Water Sampling

WELL PURGING

1.0 PURPOSE

The purpose of this procedure is to provide general reference information on well purging by the pumping method prior to the sampling of groundwater wells. The methods and equipment described are for the purging of water samples from the saturated zone of the subsurface.

2.0 SCOPE

This procedure applies to purging relatively large volumes of water in shallow to medium depth wells.

3.0 REQUIREMENTS

Methods for purging from completed wells include the use of pumps, compressed air, bailers, and various types of samplers. The primary considerations in obtaining a representative sample of the groundwater are to avoid collection of stagnant (standing) water in the well and to avoid physical or chemical alteration of the water due to sampling techniques. In a non-pumping well, there will be little or no vertical mixing of water in the well pipe or casing, and stratification will occur. The well waterin the screened section will mix with the groundwater due to normal flow patterns, but the well water above the screened section will remain isolated and become stagnant.

4.0 REFERENCES

4.1 United States Environmental Protection Agency, 1989. *Groundwater Handbook:* EPA/625/6-87/016.
4.2 *Ohio EPA, February 1995. Techinical Guidance Manual for Hydrogeologic Investigations and Groundwater Monitoring,.*

5.0 DEFINITIONS

None.

6.0 RESPONSIBILITIES

6.1 Project Manager

The Project Manager is responsible for reviewing the purging procedures used by the field crew and for performing in-field spot checks for proper purging procedures.

6.2 Site Geologist

The Site Geologist is primarily responsible for the proper well purging techniques. The Geologist will be responsible for purging of wells, performing necessary physical measurements and observations, and containment of purged water. The geologist must record pertinent information including amount of water purged, pH, specific conductivity, temperature, and turbidity in the Field Log Book.

7.0 EQUIPMENT

1. Purge pump.
2. Power source.
3. Steel retractable engineer's measuring tape (Calibrated to 0.01 foot)
4. Water level indicators.
5. Swabbing equipment (as necessary).
6. pH meter.
7. Specific conductance meter.
8. Thermometer.
9. HNu photoionization detector.
10. Containers for the development water.
11. Field log book.

8.0 PROCEDURE

8.1 General

- The amount of flushing a well should receive prior to sample collection will depend on the intent of the monitoring program and the hydrogeologic conditions.
- For the volumetric method, generally three well volumes are considered effective for purging a well.
- An alternative method of purging a well is to purge continuously (using a low volume low flow pump having a maximum purge rate of 100 ml/min.) while monitoring specific conductance, pH, and water temperature until the values stabilize in accordance with Section 8.3.

8.2 Calculations of Well Volume

To insure that the proper volume of water has been removed from the well prior to sampling it is first necessary to determine the volume of standing water in the well pipe and the volume of water in the filter pack below the well seal. The volume can be easily calculated by the following method. Calculations shall be entered in the field logbook:

1. Obtain all available information on well construction (location, casing, screens, etc.).
2. Determine well or casing and diameter.
3. Measure and record static water level (Depth below ground level or top of casing reference point).
4. Determine depth of well.

5. Calculate number of linear feet of static water (total depth or length of well pipe minus the depth to static water level).

6. Calculate the volume of water in the casing.

$V_t =$ Pi $(di/2)^2$ (TD-H) (7.48)

Where:

Pi = 3.14
Vt = Total volume, gal
di = inside diameter of casing, ft
TD = total depth of well, ft
H = depth to water, ft, from ground surface

7. Determine the minimum number of volumes to be evacuated before sampling.

8.3 Well Purging by Pumping

- Lower the purge pump into the well until it is submerged. NOTE!!: If resistance is encountered when lowering the pump into the well, WITHDRAW THE PUMP FROM THE WELL and inform the Field Team Leader.

- Direct the pump discharge hose into the receptor bucket and start the pump in accordance with the manufacturer's operations manual.

- Record total volume of water removed.

- Collect at least three samples during purging and measure physical parameters including pH, conductivity, temperature, and turbidity.

- Whenever the receptor bucket is full, dispose of the purge water via the groundwater interceptor system.

- Purging will continue until the required volume of water has been removed and the physical parameters have stabilized so that pH is $\pm$ 0.1 su, conductivity $\pm$ 10 umhos, temperature is $\pm$ 1°C, within three successive intervals.

- Decontaminate the bailers per the project-specific work plan.

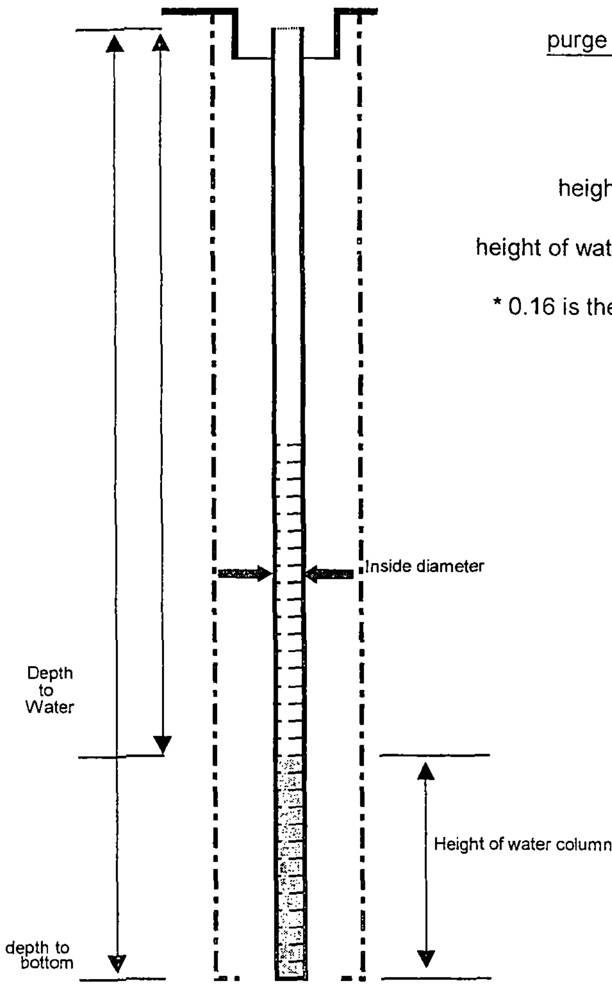
8.4 Purge Water Containment and Disposal

Purge water will be contained and disposed as detailed in the O&M-LTP Plan.

9.0 ATTACHMENTS

Groundwater Monitoring Well Purge Form

SKINNER LANDFILL SUPERFUND SITE
GROUNDWATER MONITORING WELL PURGE FORM
for 2-inch diameter schedule 40 PVC groundwater monitoring well



purge volume calculation

depth to bottom = __________ feet

depth to water = __________ feet

height of water column = __________ feet

height of water column x 0.16* = __________ gallons

* 0.16 is the gallons/foot of a 2-inch diameter well

GROUNDWATER SAMPLING

1.0 PURPOSE

The purpose of this procedure is to obtain groundwater samples that are representative of the source from which they are taken and minimize sampler exposure to groundwater contaminants. The methods and equipment described are for the collection of water samples from the saturated zone of the substrata.

2.0 SCOPE

This procedure provides information on proper equipment and techniques for groundwater sampling. Review of the information contained herein will facilitate planning of the field sampling effort by describing standard sampling techniques. The techniques described should be followed whenever applicable, noting that site-specific conditions or project-specific work plans may require adjustments in methodology.

3.0 REQUIREMENTS

Generally, wells should be sampled within three hours of purging. However, wells with poor recharge should be sampled within 24 hours of purging. Poor recharge wells are those that cannot recharge 80% of the original volume within 8 hours.

Applicable preservatives must be added to the sample containers before the samples are collected.

4.0 REFERENCES

4.1 ASTM, 1986. *Annual Book of ASTM Standards,* Section 11. Volume 11.04, D4448-85A.

4.2 Barcelona, M.J., J.P. Gibb and R.A. Miller, 1983. *A Guide to the Selection of Materials for Monitoring Well Construction and Groundwater Sampling,* ISWS Contract Report 327, Illinois State Water Survey, Champaign, IL.

4.3 Johnson Division, UOP, Inc., 1975. *Groundwater and Wells, A Reference Book for the Water Well Industry.* Johnson Division, UOP, Inc., Saint Paul, MN.

4.4 Nielson, D.M. and G.L. Yeates, 1985. *A Comparison of Sampling Mechanisms Available for Small-Diameter Groundwater Monitoring Wells.* Groundwater Monitoring Review 5:38-98.

4.5 Scalf, M.R., J.F. McNabb, W.J. Dunlapp, R.L. Crosby and J. Fryberger, 1981. *Manual of Groundwater Sampling Procedures.* R.S. Kerr Environmental Research Laboratory, Office of Research and Development, USEPA, Ada, OK.

4.6 USEPA, 1980. *Procedures Manual for Groundwater Monitoring at Solid Waste Disposal Facilities.* Office of Solid Waste, United States Environmental Protection Agency, Washington, D.C.

4.7 USEPA, 1986. *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, EPA SW-846.

4.8 USEPA, 1987. *Groundwater Handbook,* EPA/625/6-87/016.

4.9 USEPA, 1987. *A Compendium of Superfund Field Operations Methods,* EPA/540/P-87/001.

5.0 DEFINITIONS

None.

6.0 RESPONSIBILITIES

6.1 Project Manager

Responsible for reviewing the sampling procedures used by the field crew and for performing in-field spot checks for proper sampling procedures.

6.2 Site Geologist

The Site Geologist is primarily responsible for the proper acquisition of the groundwater samples.

7.0 EQUIPMENT

Sample containers shall conform with U.S. EPA regulations for preservation of appropriate contaminants.

Ideally, sampling equipment should be completely inert, economical, easily decontaminated, easily sterilized, reusable, able to operate at remote sites in the absence of power sources, and capable of delivering variable rates for well flushing and sample collection. The sample withdrawal equipment (evacuation devices) to be used on this project are submersible pumps. Other equipment to be used include:

1. Sample Packing and Shipping Equipment.
2. Coolers for sample shipping and cooling.
3. Chemical preservatives.
4. Appropriate packing cartons and filler.
5. Labels.
6. Chain-of-custody documents.
7. Thermometer.
8. pH meter.
9. Portable HNu photoionization detector.
10. Specific conductivity meter.
11. Water-level indicator.
12. Flow meter.
13. Field sampling logbooks.
14. Pails.

15. Gamma and Beta Radiation Detector.

8.0 PROCEDURE

8.1 General

To be useful and accurate, a groundwater sample must be representative of the particular saturated zone of the substrata being sampled. The physical, chemical and bacteriological integrity of the sample must be maintained from the time of sampling to the time of testing in order to keep any changes in water quality parameters to a minimum.

The groundwater sampling program should be developed with reference to ASTM D4448-85A, Standard Guide for Sampling Groundwater Monitoring Wells. The ASTM guide is not intended as a monitoring plan or procedure for a specific application, but rather as a review of methods.

The primary considerations in obtaining a representative sample of the groundwater are toavoid collection of stagnant (standing) water in the well, and to avoid physical or chemical alteration of the water due to sampling techniques. In a non-pumping well, there will be little or no vertical mixing of water in the well pipe or casing. Stratification may occur. The well water in the screened section will mix with the groundwater due to normal flow patterns, but the well water above the screened section will remain isolated and become stagnant. To safeguard against collecting non-representative stagnant water in a sample, the following approach should be followed during sample withdrawal:

1. All monitoring wells shall be purged prior to withdrawing a sample. Evacuation of three volumes is recommended for a representative sample. Purge water will be contained and disposed as detailed in SOP-5.

2. For wells that can be purged dry, the wells should be evacuated and allowed to recover prior to sample withdrawal.

3. For high-yield monitoring wells which cannot be evacuated to dryness, there is no absolute safeguard against contaminating the sample with stagnant water. The use of a pump and certain techniques of sample withdrawal may minimize this possibility.

Stratification of contaminants may exist in the groundwater either in terms ofconcentration gradients as a result of mixing and dispersion processes in a homogeneous layer, or due to layers of variable permeability into which a greater or lesser amount of the contaminant plume has flowed. Excessive pumping can dilute or increase the contaminant concentrations in the recovered sample compared to what is representative of the integrated water column at that point. This can result in the collection of a non-representative sample. Water produced during purging shall be collected, stored or treated and discharged as allowed.

8.2 Calculations of Well Volume

To ensure that the proper volume of water has been removed from the well prior to sampling, it is first necessary to determine the volume of standing water in the well casing and the volume of water in the filter pack below the well seal. The volume can be easily calculated by the following method. Calculations should be entered into the field logbook:

1. Obtain the available information on well construction (location, casing, screens, etc.).
2. Determine well or casing diameter.
3. Measure and record static water level (depth below ground level or top of casing reference point).
4. Determine depth of well.
5. Calculate number of linear feet of static water (total depth or length of well casing minus the depth to static water level).
6. Calculate the volume of water in the casing.

$Vt = Pi\ (di/2)^2(TD-H)(7.48)$

Where,

Pi = 3.14
Vt = Total volume, gal
di = inside diameter of casing, ft
TD = total depth of well, ft
H = depth to water, ft, from ground surface
P =

7. Determine the minimum number of volumes to be evacuated before sampling.

8.3 General

The amount of flushing a well should receive prior to sample collection will depend on the intent of the monitoring program and the hydrogeologic conditions.

For defining a contaminant plume, a representative sample of only a small volume of the aquifer is required. These circumstances require that the well be pumped sufficiently to remove the stagnant water but not long enough to induce significant groundwater.

8.4 Sampling

8.4.1 Sampling Methods

The collection of a groundwater sample is made up of the following steps.

1. Record the sample location, site, anticipated sample time, and field sample number using a indelible

pen. Fill out sample labels for each of the required sample containers and place labels onto the appropriate sample containers. Labels must be waterproof to prevent water damage. The following information may be included on the sample label:

- site name;
- field identification or sample station number;
- date and time of sample collection;
- type of sample (matrix) and a brief description of the sampling location;
- printed full name of the sampler;
- sample preservative used; and
- types of analyses to be performed.

If a sample is split with another party, sample labels with identical information should be attached to each of the sample containers.

2. Open the well cap and use volatile organic detection meter (HNu) to monitor the escaping gases at the well head to determine the need for respiratory protection.

3. Sound the well for total depth and water level (using decontaminated equipment) and record these data in the field notebook. Calculate the fluid volume in the well.

4. Calculate depth from the casing top to the midpoint of the screen or well section open to the aquifer. Any dry wells encountered must be noted.

5. In the event that recovery time of the well is very slow (e.g., 24 hours), sample collection may be delayed until the following day. If the well has been purged early in the morning, sufficient water may be standing in the well by the day's end to permit sample collection. If the well is incapable of producing a sufficient volume of sample at any time, take the largest quantity available and record in the logbook.

6. To ensure that groundwater samples are representative of actual conditions, samplers must work efficiently to minimize the loss of groundwater contaminants and the introduction of foreign contaminants. To prevent contamination of samples, the sample bottles should be opened only when receiving sample preservatives or groundwater samples and closed immediately afterwards. The sampler should quickly add the sample into the sample containers, while minimizing aeration and loss of volatile contaminants. Samples collected for analysis of volatile constituents will be collected first, followed by samples collected for analysis of SVOCS, pesticides/PCBs, metals, and cyanide. Additional water from the well will be divided among the remaining sample bottles. For analysis that requires filtered samples, it is preferred that the samples be allowed to settle in a separate sample container, followed by decanting and then filtration. Field filtration may also be accomplished using an in-line filter. Consult the specific analytical procedure for details. Large volume samples for extractable organic compounds, total metals, etc., should be collected last.

When a sample bottle is filled, the bottle must be tightly capped as soon as possible.

7. Efficiency and care must be utilized to obtain representative samples for volatile organic analysis. Unnecessary delays or poor sampling technique will lead to loss of the volatile constituents from the

sample.

Add the required preservatives to the sample containers immediately prior to or after collecting the sample, label all containers and stage the collection setup before collecting the sample to minimize sampling time.

Prevent unnecessary stripping of volatile constituents from the sample by minimizing turbulence and aeration when filling the sample container. Quickly fill the sample container until a positive meniscus is achieved above the rim of the container and cap the container immediately. Gently tap thesample container to dislodge any air bubbles and verify that no bubbles are present. If bubbles are detected, immediately uncap the sample, add additional sample from the bailer until a positive meniscus is reestablished, immediately recap the sample and check the sample for bubbles. Repeat this step until the sample contains no bubbles and all required samples are obtained.

8. After sampling, replace the well cap.

9. As soon as all samples are collected, promptly prepare the samples for shipment inaccordance with the LTPP QAPP, and store the samples collected for volatile organic analysis in a cooler with pre-packaged ice. Attach a custody seal to the shipping package as described in the LTPP QAPP. Make sure that the chain-of-custody forms are properly filled out and enclosed or attached.

10. Record all sampling information in the field log book.

11. Decontaminate all equipment.

8.4.2 Sample Containers

Use the laboratory-supplied sample containers, which are pre-cleaned and appropriate for the analytical method for which you are sampling.

8.4.3 Preservation of Samples and Sample Volume Requirements

Sample preservation techniques and volume requirements depend on the type and concentration of the contaminant and on the type of analysis to be performed. The Skinner Landfill LTPP QAPP describes the sample preservation and volume requirements for the chemicals that will be analyzed.

8.4.4 Field Filtration

All filtration must occur in the field immediately upon collection. Filters must be prerinsed with organic-free water.

Samples for organic analyses must never be filtered.

8.4.5 Handling and Transporting Samples

After collection, samples should be handled as little as possible. It is preferable to use self-contained "chemical" ice (e.g., "blue ice") to reduce the risk of contamination. If natural ice is used, it should be bagged and steps taken to ensure that the melted ice does not cause sample containers to be submerged and possibly cross-contaminated. All sample containers should be enclosed in plastic bags or cans to prevent cross-contamination. Samples should be secured in the ice chest to prevent movement of sample containers and possible breakage.

8.4.6 Sample Holding Times

Holding times (i.e., allowed time between sample collection and analysis) for routine samples are given in Table 6.

8.5 Records

Records will be maintained for each sample that is taken. Record the following information:

- o Sample identification (site name, location, project number; sample name/number and location; sample type and matrix; time and date; sampler's identity).
- o Sample source and source description.
- o Field observations and measurements (appearance; volatile screening; field chemistry; sampling method).
- o Sample disposition (analyses to be run; number and size of bottles; preservatives added).
- o Additional remarks - (e.g., sampled in conjunction with regulatory authorities; samples for specific conductance value only; samples for key indicator; etc.).

9.0 ATTACHMENTS

None.

MEASUREMENT OF TEMPERATURE IN WATER

1.0 Title: Standard Operating Procedure for the Measurement of Temperature in Water

2.0 Location

This SOP may be used anywhere on or off the Skinner site as long as the requirements of the SOP are met.

3.0 Purpose

This SOP will be used to measure the temperature of influent, effluent, groundwater, and surface water samples.

4.0 Scope

This SOP describes the calibration check and use of an alcohol, bimetallic, or electronic thermometer to measure the temperature of influent, effluent, groundwater, and surface water samples. A thermometer which is properly calibrated may also be used to indicate ambient temperature.

5.0 References

5.1 Waste Management, Inc. Manual for Groundwater Sampling.

6.0 Sample Handling and Preservation

Temperature measurements must be made in-situ, or as soon as possible after a portion of the sample is transferred to a beaker, to avoid temperature changes due to environmental factors.

7.0 Apparatus and Materials

1. alcohol, bimetallic, or electronic thermometer with a range of at least 0°C to 100°C, with at least 0.1°C intervals
2. ice bath
3. boiling water bath
4. small (100-200 ml) beakers
5. Chemwipes or equivalent

8.0 Analytical Procedures

1. Ensure that the thermometer calibration has been checked within 30 days of use. If not, suspend the sensing probe of the thermometer directly into an ice bath which has been equilibrating for at least 5 minutes. If the thermometer reads $0 \pm 1°C$, record 0.0°C. If the calibration check was satisfactory, complete the calibration check by signing and dating the record.

2. Suspend the sensing probe directly into the sample, or into a portion of the sample which has been collected in a small beaker. Ensure that the probe does not contact anything other than the sample medium.

3. Allow the thermometer to stabilize, and then record the temperature.

4. Remove the thermometer and wipe dry.

9.0 Quality Control

Calibration data should be maintained and available for reference or inspection. The thermometer must be calibrated daily or prior to use, whichever is more frequent.

10.0 Data Analysis

Since the thermometer is a direct-reading instrument, the data is recorded directly.

11.0 Documentation

Record all measurement values.

THE FIELD MEASUREMENT OF pH IN WATER

1.0 Title: Standard Operating Procedure for the Field Measurement of pH in Water

2.0 Location

This SOP may be used anywhere on or off the Skinner Landfill Site as long as the requirements of the SOP are met.

3.0 Purpose

This SOP will be used to measure pH of influent, effluent, groundwater, and surface water samples.

4.0 Scope

This SOP describes the use of a portable, temperature compensating pH/conductivity meter for field use. The instrument is calibrated using commercially available buffer reference solutions ator near 25°C, and the instrument reading is adjusted to equal the pH of the standard at 25°C.

5.0 References

1. "Test Methods of Evaluating Solid Wastes", Third Edition (1986), SW-846, Procedure 9040.

2. Cole Parmer Model DspH-3 Operating Instructions.

6.0 Sample Handling and Preservation

This procedure can be used to measure the pH of the water samples in-situ or in a beaker which has been triple-rinsed with distilled water and at least once with sample. If the measurement is to be made at some later time, the sample must be placed in a laboratory supplied bottle, filled to overflowing, and capped immediately to avoid dissolution of atmospheric gases. In such cases, the sample should be stored at 4 °C and analyzed within 24 hours.

Standard pH buffers should be stored below 30 degrees C to minimize the likelihood of error due to evaporation or microbial growth. The standard should be discarded if the expiration date is past, or if color, turbidity, or visible microbial growth develops.

7.0 Apparatus and Materials

1. Cole Parmer pH/Conductivity meter (DspH-3) or equivalent

2. pH 4, 7, and 10 buffer solutions

3. Distilled water

4. Small screw driver

5. Beakers (100 ml or larger)

6. Bottle labeled "waste pH buffer solution"

8.0 Analytical Procedure

1. Slide back the electrode compartment to release pH and conductivity electrodes.

2. Deploy electrodes in either the 90 or 180 degree measurement position.

3. Remove the bottom section of the protective pH probe cap.

4. Thoroughly rinse the pH probe and remaining parts of the probe cap with distilled water.

5. Energize the instrument be depressing the on/off switch once. (Ensure the instrument is in the pH mode by pressing the pH/PPM microswitch as needed).

6. Slide back the bottom compartment cover to the first stop, exposing the adjustment pots.

7. Transfer enough pH-7 buffer solution to cover at least ½ of the pH probe into a beaker that has been either triple-rinsed with distilled water and once with the same buffer solution, or a disposable beaker that has been rinsed once with the buffer solution. Measure the buffer temperature and record. Using the attached Table, record the corresponding temperature-adjusted pH value.

8. Immerse the sensing portion of the probe at least ½ its length into the buffer solution. Allow the reading to stabilize while slightly agitating the solution.

9. Adjust the CAL pot until the instrument indicated the correct temperature-compensated pH value.

10. Remove the probe from the test solution and rinse with distilled water.

11. Discard the used pH buffer into the collection bottle for subsequent disposal.

12. Select the appropriate pH4 or pH10 buffer solution (choice of buffers should be such that this buffer and the pH 7.0 buffer bracket the sample pH).

13. Immerse the sensing portion of the probe at least ½ its length into the buffer solution. Allow the reading to stabilize while slightly agitating the solution.

14. Adjust the SLOPE pot until the instrument indicates the correct temperature-compensated pH value.

15. Remove the probe from the test solution and rinse with distilled water.

16. Discard the used pH buffer into the collection bottle for subsequent disposal.

17. Immerse the sensing portion of the probe at least ½ its length into the sample. (This measurement can be made in-situ, or a portion of the sample can be transferred into a beaker that has been triple-rinsed with distilled water and once with the sample solution). Allow the reading to stabilize while slightly agitating the solution.

18. Read the sample pH and record. (NOTE: If the sample pH is outside the range of the calibration standards, repeat the instrument calibration using the correct buffer solution prior to remeasuring the sample pH. Remove the probe from the sample and rinse thoroughly with distilled water before repeating the instrument calibration).

19. Remove the probe from the sample and rinse thoroughly with distilled water.

20. Measure and record the sample temperature.

21. If no further measurements are being made, de-energize the instrument, and replace to the protective pH probe cap filled with fresh pH 4 buffer or deionized water.

9.0 Quality Control

Calibration data should be maintained and available for reference or inspection. Recalibrate the instrument per project requirements. Duplicate samples should be measured per project requirements.

10.0 Data Analysis

Since this meter is a direct-reading instrument, the data is recorded directly.

11.0 Documentation

Record all measurement values.

Temperature Adjusted Buffer pH Values Table

Temp ($_{O}$C)	pH 4 Buffer*	pH 7 Buffer*	pH 10 Buffer**
0	4.01	7.12	
1		7.11	
2		7.11	
3		7.10	
4	4.01	7.10	
5		7.09	
6		7.08	
7		7.08	
8		7.07	
9		7.07	
10	4.00	7.06	10.15
11		7.06	10.14
12		7.05	10.13
13		7.05	10.12
14		7.04	10.11
15	4.00	7.04	10.10
16		7.04	10.09
17		7.03	10.08
18		7.03	10.07
19		7.02	10.06
20	4.00	7.02	10.05
21		7.02	10.04
22		7.01	10.03
23		7.01	10.02
24		7.00	10.01
25	4.01	7.00	10.00
26			9.99
27			9.98
28			9.97
29			9.97
30	4.01		9.96

*Cole Parmer Instruments
**VWR Scientific

MEASUREMENT OF CONDUCTIVITY IN WATER

1.0 Title: Standard Operating Procedure for the Field Measurement of Conductivity in Water

2.0 Location

This SOP may be used anywhere on or off the Skinner site as long as the requirements of the SOP are met.

3.0 Purpose

This SOP will be used to measure conductivity of influent, effluent, groundwater, and surface water samples. This SOP is not applicable to solid samples.

4.0 Scope

This SOP describes the use of a portable, temperature-compensating pH/conductivity meter for field use. The instrument is calibrated using a commercially available KCL reference solution at or near 25°C, and the instrument reading is adjusted to be equal to the conductivity of the standard (at 25°C). A zero-conductivity adjustment is also made.

Because field measurements may be made at temperatures other than 25°C, and the temperature coefficient of the internal compensator may be different than the sample being measured, the temperature of the water sample shall be measured and recorded as well as the conductivity.

5.0 References

1. "YSI Conductivity Calibrator Solutions Instructions," YSI Inc., Yellow Springs, Ohio.

2. "Standard Methods for the Examination of Water and Wastewater," 16th Edition (1985), Method 205.

3. "Test Methods for Evaluating Solid Waste," Third Edition 91986), SW-846, Procedure 9050.

6.0 Sample Handling and Preservation

This procedure can be used to measure the conductivity of water samples in-situ or in a beaker which has been triple-rinsed with distilled water and at least once with sample water. If the measurement is to be made at some later time, the sample must be placed in a pre-cleaned laboratory bottle, filled to overflowing, and capped immediately to avoid dissolution of atmospheric gases. In such cases, the samples should be stored at 4°C and analyzed within 24 hours.

Conductivity standards should be stored below 30°C to minimize the likelihood of error due to evaporation or to microbial growth. The standard should be discarded if the expiration date is past, or if color, turbidity, or visible microbial growth develops.

7.0 Apparatus and Materials

1. Cole Parmer pH/Conductivity meter (DspH-3) or equivalent

2. Conductivity standards

3. Small screw driver

4. Chemwipes or equivalent

5. Beakers (100 ml or larger)

6. Laboratory supplied sample jars with labels and seals

8.0 Analytical Procedure

1. Slide back the electrode compartment to release pH and conductivity electrodes.

2. Deploy electrodes in either the 90 or 180 degree measurement position.

3. Remove the protective cap.

4. Rinse the conductivity probe thoroughly with distilled water.

5. Pat dry the probe with a chemwipe.

6. Energize the instrument by depressing the on/off switch once. (Ensure the instrument is in the conductivity mode.) For each range change desired, depress the pH/PPM microswitch once. The YSI unit utilizes 3 ranges for conductivity. The range sequence is pH-200K-20K-2K. In most cases the 2K range will be used. Only the 200K range uses the X10 enunciator.

7. Slide back the bottom compartment cover to the first stop, exposing the adjustment pots.

8. The dried probe should read 0 in air; if not, adjust the ZERO pot until the instrument reads 0. If the conductivity meter cannot zero, it may indicate dried solids on the sensor. If so, clean the probe with a mild detergent solution, thoroughly rinse with distilled water, let the probe airdry, and repeat this step.

9. Immerse the probe in a solution of known conductivity (normally 1000+/-0.5% umhos/cm), and record the value. Also measure and record the temperature of the conductivity standard.

10. Adjust the SPAN pot until the instrument indicates the conductivity value of the known solution.

11. Remove the probe from the test solution and thoroughly rinse with distilled water and pat the probe dry.

12. Rinse the probe with the sample by placing the probe into a beaker containing an aliquot of the sample and dip in and out several times. Then, place the probe into another aliquot of the sample.

13. Read the sample conductivity. If the value exceeds the value of the calibration standard by more than a factor of 10, repeat the instrument calibration using a standard conductivity solution in the same range as the sample, then repeat Steps 8.12 through 8.13. Also measure the sample temperature to the nearest °C.

14. Record the measured conductivity reading and sample temperature.

15. Rinse the probe thoroughly with distilled water.

16. If no further measurements are being made, de-energize the instrument, remove the probe and replace the protective cap.

9.0 Quality Control

This procedure is specifically designed for survey-type field measurements, and is not capable of generating results of high precision or accuracy. If results of higher quality are desired, measurements must be made at 25 ± 0.1 °C using a calibrated conductivity meter-cell combination. Method 9050 of SW-846 is appropriate for those cases.

Calibration data should be maintained and available for reference or inspection. Recalibrate the instrument per project requirements. Duplicate samples should be measured per project requirements.

10.0 Data Analysis

Since this meter is a direct-reading instrument, the data is recorded directly.

11.0 Documentation

Record all measurement values.

1.0 Title: Standard Operating Procedure for the Measurement of Dissolved Oxygen in Water

2.0 Location

This SOP may be used anywhere on or off the PRL as long as the requirements of the SOP are met.

3.0 Purpose

This SOP will be used to measure the dissolved oxygen content of groundwater and leachate samples.

4.0 Scope

This SOP describes the calibration and use of an electronic meter to measure the dissolved oxygen of groundwater and other aqueous samples.

5.0 References

YSI Dissolved Oxygen Meter Operators Manual.

6.0 Sample Handling and Preservation

Dissolved Oxygen measurements must be made in-situ, or as soon as possible after a portion of the sample is transferred to a beaker. Dissolved oxygen measurements should be made within 5 minute of sample collection to avoid changes in the dissolved oxygen content of the sample due to changes in the environmental factors (i.e., temperature, CO_2 content, pressure, etc.).

7.0 Apparatus and Materials

1. YSI Dissolved Oxygen Meter
2. small (100-200 ml) beakers
3. Chemwipes or equivalent

8.0 Analytical Procedure

8.1 Calibration Check

Check calibration of dissolved oxygen meter once a day using the following procedures:

- o Turn unit on.
- o Place dissolved oxygen probe in distilled water.
- o Record the temperature of the water and air pressure.
- o Calibrate the meter to the percent oxygen saturation based on the temperature and pressure measurements.

- o Zero the meter.

- o Place the dissolved oxygen probe in the water, bubble air through the water for 5 minute, and record the dissolved oxygen content using the procedures described in Section 8.2 of this SOP.

- o Compare the accuracy of the dissolved oxygen measurement to the measurement last recorded. If the measurement is greater than $\pm$ 10% repeat the measurement. If the measurement is stillgreater than $\pm$ 10% replace unit with another meter.

8.2 Sample Measurement Procedures

- o Turn the meter on.

- o Record air temperature and pressure.

- o Calibrate the meter to the percent oxygen saturation based on the temperature and pressure measurements.

- o Zero the meter.

- o Submerse the probe in the liquid sample.

- o Wait for the dissolved oxygen measurements to stabilize and then record the measurement.

9.0 Quality Control

The calibration check data should be maintained and made available forreference or inspection. Check the calibration of the meter daily.

Duplicate measurements will be collected every 10 samples or fewer. If the duplicate measurement is greater than $\pm$ 20%, recheck the calibration of the meter. If the meter measurement is greater than$\pm$ 20% of the last calibration check measurement, replace the unit and remeasure all samples (if possible) since the last duplicate measurement.

10.0 Data Analysis

Since the meter is a direct-reading instrument, the data is recorded directly.

11.0 Documentation

Record all measurement values.

SURFACE WATER SAMPLING

1.0 PURPOSE

The purpose of this procedure is to define the requirements necessary for surface water sampling.

2.0 SCOPE

Surface water sampling is applicable to almost any site that has surface drainage on it or at any location located hydraulically downgradient from the site.

3.0 REQUIREMENTS

Many factors must be considered in developing a sampling program for surface water including study objectives; accessibility; site topography flow, mixing and other physical characteristics of the water body; point and diffuse sources of contamination; and personnel and equipment available to conduct the study. For waterborne constituents, dispersion depends on the vertical and lateral mixing within the body of water.

4.0 REFERENCES

4.1 Feltz, H.R., 1980. *Significance of Bottom Material Data in Evaluating Water Quality in Contaminants and Sediments*. Ann Arbor, Mich., Ann Arbor Science Publishers, Inc., V.i, p. 271-287.

4.2 Kittrell, R.W., 1969. *A Practical Guide to Water Quality Studies of Steams*. U.S. Federal Water Pollution Control Administration, Washington, D.C., 135 p.

4.3 USEPA, 1980. *Standard Operating Procedures and Quality Assurance Manual*. Water Surveillance Branch, USEPA Surveillance and Analytical Division, Athens, GA.

4.4 US Geological Survey, 1977. *National Handbook of Recommended Methods for Water-Data Acquisition*. Office of Water Data Coordination, USGS, Reston, VA.

5.0 DEFINITIONS

Environmental Sample - low concentration sample typically collected offsite and not requiring DOT hazardous waste labeling as a high hazard sample.

6.0 RESPONSIBILITIES

6.1 Field Geologist

The Field Geologist has overall responsibility for the correct implementation of surface water sampling activities, including review of the Field Sampling Plan.

7.0 EQUIPMENT

1. Sampling bottles treated with preservatives if necessary.
2. Specific conductivity meter.
3. pH meter.
4. Thermometer.
5. D.O. meter.
6. Beta-gamma radiation meter.
7. Dip sampler.
8. Weighted bottle sampler.
9. Hand pump.

8.0 PROCEDURE

The following section outlines commonly used procedures for collecting surface water samples. Surface water sampling will begin at the most downstream location and proceed progressively to the upstream locations. It is anticipated that Dip Sample will be used to collect surface water samples during the RA.

8.1 Water Sampling Techniques

8.1.1 Dip Sampling

Water is often sampled by filling a container, either attached to a pole or held directly, from just beneath the surface of the water (a dip or grab sample). Constituents measured in grab samples are only indicative of conditions near the surface of the water column and in the cross section.

8.1.2 Weighted Bottle Sampling

A grab sample can also be taken using a weighted holder that allows a sample to be lowered to any desired depth, opened for filling, closed and returned to the surface. This allows discrete sampling with depth. Alternatively, an open bottle can be lowered to the bottom and raised to the surface at a uniform rate so that the bottle collects sample throughout the total depth and is just filled on reaching the surface.

A closed weighted bottle sampler consists of a stoppered glass or plastic bottle, a weight and/or holding device, and lines to open the stopper and to lower or raise the bottle. The procedure for sampling is:

1. Gently lower the sampler to the desired depth so as not to remove the stopper prematurely (watch for bubbles).
2. Pull out the stopper with a sharp jerk of the sampler line.
3. Allow the bottle to fill completely, as evidenced by the cessation of air bubbles.
4. Raise the sampler and cap the bottle.
5. Decontaminate the outside of the bottle. The bottle can be used as the sample container (as long as the original bottle is an approved container).

8.1.3 Hand Pumps

Hand pumps may be operated by peristaltic, bellows, diaphragm, or siphon action. Hand pumps which operate by a bellow, diaphragm, or siphon action should not be used to collect samples which will be analyzed for volatile organics because the slight vacuum applied may cause loss of these contaminants.

Tubing used for the inlet hose should be nonreactive (preferably Teflon). The tubing and liquid trap must be thoroughly decontaminated between uses (or disposed of after one use).

When sampling, the tubing is weighted and lowered to the desired depth. The sample is then obtained by operation of the pump and subsequently transferred from the trap to the sample container.

9.0 ATTACHMENTS

None.

APPENDIX D

LTPP QAPP

OPERATION & MAINTENANCE – LONG TERM PERFORMANCE PLAN

QUALITY ASSURANCE PROJECT PLAN

SKINNER LANDFILL SITE
BUTLER COUNTY
WEST CHESTER, OHIO

Prepared for:

Skinner Landfill Work Group
c/o Ben Baker
The Dow Chemical Company
Ashman Center
4520 East Ashman
Midland, MI 48764

Prepared by:

Earth Tech, Inc.
200 Vine Street
Wilder, KY 41076

August 2003 – FINAL

LIST OF ACRONYMS

AOC	Administrative Order on Consent
BCDES	Butler County Department of Environmental Services
BOD	Biochemical Oxygen Demand
CLP	Contract Laboratory Program
COD	Chemical Oxygen Demand
CRL	Central Regional Laboratory
DNAPLs	Dense Non-Aqueous Phase Liquids
DQOs	Data Quality Objectives
ft	Feet
GCAL	Gulf Coast Analytical Laboratories
HASP	Health and Safety Plan
ID	Inner Diameter
MS	Matrix Spike
MSD	Matrix Spike Duplicate
MSL	Mean Sea Level
NCP	National Contingency Plan
NITS	National Institute of Testing and Standards
OEPA	Ohio Environmental Protection Agency
OM-LTP	Operation & Maintenance – Long Term Performance
PCBs	Polychlorinated Biphenyls
PAHs	Polynuclear Aromatic Hydrocarbons
PPE	Personal Protective Equipment
PRP	Potentially Responsible Party
QA	Quality Assurance
QAO	Quality Assurance Objectives
QAPP	Quality Assurance Project Plan (Laboratory)
QAPP	Quality Assurance Project Plan
QC	Quality Control
ROD	Record of Decision
RPM	Remedial Project Manager
SLWG	Skinner Landfill Work Group
SU	Standard Units
SOP	Standard Operating Procedure
SOW	Statement of Work

LIST OF ACRONYMS - CONTINUED

SVOCs	Semi-Volatile Organic Compounds
TAL	Target Analyte List
TCL	Target Compound List
TDS	Total Dissolved Solids
TSS	Total Suspended Solids
U.S. EPA	United States Environmental Protection Agency
VOCs	Volatile Organic Compounds

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Appendix

Selected Sections from GCAL Quality Assurance Program Plan I

1.0 INTRODUCTION

This Quality Assurance Project Plan (QAPP) is intended to supplement the Operation and Maintenance–Long Term Performance Plan (OM-LTP Plan) for the Skinner Landfill, West Chester, Ohio. This Plan presents minimum procedures to assure that the precision, accuracy, completeness and representativeness of data are known and documented. This QAPP presents the organization, objectives, functional activities and specific quality assurance/quality control (QA/QC) activitiesassociated with implementing the OM-LTP Plan at the Skinner Landfill Site.

All QA/QC procedures will be in accordance with applicable professional technical standards, U.S. EPA requirements, government regulation and guidelines, and specific project goals and requirements. The laboratory to be used during this project is Gulf Coast Analytical Laboratories (GCAL). GCAL has prepared a Comprehensive Quality Assurance Project Plan (QAPP) dated September, 1998 (Appendix I) which documents how compliance with these requirements will be achieved. In the event another laboratory is selected to replace GCAL, applicable sections of the replacement laboratory's QAPP will be attached to this QAPP, pending approval by the U.S. EPA.

This QAPP was prepared by Earth Tech on behalf of the Skinner Landfill Work Group in accordance with all U.S. EPA QAPP guidance documents including the Contract Laboratory Program (CLP) guidelines, Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans (QAMS-005/80), and the U.S. EPA Region V Model QAPP (1991) and Model Mini-QAPP (1993).

2.0 QUALITY ASSURANCE OBJECTIVES FOR ANALYTICAL DATA

The overall QA objective is to develop and implement procedures for field sampling, chain-of-custody, laboratory analysis, and reporting that will provide results that are legally defensible. Specific procedures for sampling, chain-of-custody, laboratory analysis, reporting of data, internal QC, audits and corrective action are described in other sections of the QAPP. The purpose of this section is to address the specific objectives for accuracy, precision, completeness, representativeness and comparability.

2.1 Level of Quality Control Effort

Field blank, trip blank, duplicate, matrix spike and matrix spike duplicate samples will be analyzed to assess the quality of the data resulting from the field sampling program. Field blanks will consist of deionized water placed in sample containers at the site. Field blanks are used to check for contamination, which may have been introduced as a result of ambient field conditions. Field blanks foraqueous samples shall be collected at the rate of at least one per 10 investigative samples (i.e., 10%).

Trip blanks will consist of deionized water placed in sample containers in the laboratory. These samples will accompany the other (empty) sample containers to the site, be kept with them in the field and accompany the field samples back to the laboratory. Trip blanks are used to assess the potential for volatile organic compound (VOC) contamination of samples due to contaminant migration during shipment and storage. One trip blank will accompany each shipment of VOC samples.

Field duplicate for groundwater samples will consist of sequentially collected samples obtained from the same sampling point. They are analyzed to check for sampling and analytical reproducibility. Duplicate samples will be collected at the rate of one per 10 investigative samples (i.e., 10%).

Matrix spike samples (which are prepared in the laboratory from extra investigative sample volume collected in the field) provide information about the effect of the sample matrix on the preparation and analytical measurement methodology. The extra volumes required for aqueous samples are triple the normal volume for VOC analysis and double the normal volume for other organic analyses. These extra volumes are in addition to the normal volume requirements for the investigative sample.

All matrix spikes for organic analyses are performed in duplicate and are hereafter referred to as MS/MSD samples. MS/MSD samples will be collected (for organic analysis) at the rate of one per 20 investigative samples (i.e., 5%). A matrix spike and laboratory duplicate for inorganics will be analyzed at the rate of one each per 20 investigative samples (i.e., 5%). The extra volume required for aqueous samples is double the normal volume for inorganic samples. This extra volume is in addition to the normal volume requirements for the investigative sample.

2.2 Accuracy and Precision of Analysis

The fundamental QA objective with respect to accuracy and precision of laboratory analytical data is to achieve the QC acceptance criteria of the analytical protocols. The accuracy and precision requirements for analytical work for this project will be those specified in the CLP SOW (OLC02.1 for organics andILM04.0 for inorganics).

Precision is a measure of mutual agreement among individual measurements of the same property under prescribed and similar conditions.

Precision of the measurement data for this project will be based upon duplicate analyses (replicability), control sample analyses (repeatability), and results for duplicate field samples (sample replicability). A field duplicate is defined as a sample that is divided into two equal parts for the purpose of analysis. Field duplicates will be collected for all sample matrices and analyzed for all parameters. Discretely sampled field duplicates are useful in determining sampling variability. However, greater than expecteddifferences between duplicates may occur because of variability in the sample material.

Field duplicates shall be used as a quality control measure to monitor precision relative to sample collection activities.

Analytical precision shall be evaluated by using MS/MSD, laboratory control samples (LCS), or sample duplicates. Precision is calculated in terms of Relative Percent Difference (RPD).

Accuracy is the degree of agreement of a measurement or average of measurements with an accepted reference or “true” value. Accuracy is a measure of bias in the system.

Accuracy of the measurement data will be assessed and controlled as follows. Results for blanks, matrix, laboratory control, and surrogate spikes will be the primary indicators of accuracy. Theseresults will be used to control accuracy within acceptable limits by requiring that they meet specific criteria. As spiked samples are analyzed, spike recoveries will be calculated and compared to pre-established acceptance limits.

Acceptance limits will be based upon previously established laboratory capabilities for similar samples using control chart techniques. In this approach, the control limits reflect the minimum and maximum recoveries expected for individual measurements for an in-control system. Recoveries outside the established limits indicate some assignable cause, other than normal measurement error, and the need for corrective action. This includes recalibration of the instrument, reanalysis of the QC sample, reanalysis of the samples in the batch, or flagging the data as suspect if the problem cannot be resolved. Recovery of matrix spikes may depend on sample homogeneity.

2.3 Completeness, Representativeness, and Comparability

Completeness is a measure of the amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained under normal conditions. It is expected that the laboratories will provide data meeting QC acceptance criteria for 95 percent or more for all samples tested using CLP SOWs (OLC02.1 for organics and ILM04.0 for inorganics). The calculation of completeness is described in Section 11.0 below. The field data will also be checked for completeness by comparing the amount of usable data as compared to the total amount of usable data expected.

Representativeness expresses the degree to which data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition. Representativeness is a qualitative parameter, which is dependent upon the proper design of the sampling program and proper laboratory protocols. The sampling network was selected to provide data representative of site conditions based on previous studies conducted at the site. Representativeness will be satisfied by ensuring proper sampling techniques are used, proper analytical procedures are followed, and holding times of samples are not exceeded. Representativeness will also be assessed by the analysis of field duplicate samples.

Comparability expresses the confidence with which one data set can be compared with another. The extent to which existing and planned analytical data will be comparable depends on the similarity of sampling and analytical methods. Analytical results are comparable to results of other laboratories with the use of the following procedures/programs: instrument standards traceable to National Institute of Testing and Standards (NITS) or U.S. EPA sources; the use of standard methodology; reporting results from similar matrices in consistent units; applying appropriate levels of quality control within the context of the laboratories quality assurance program; and participation in inter-laboratory studies to document laboratories performance. By using traceable standards and standard methods, the analytical results can be compared to other laboratories operating similarly. The QA Program documents internal performance, and the inter-laboratory studies document performance compared to other laboratories. Periodic laboratory proficiency studies are instituted as a means of monitoring intra-laboratory performance. The procedures used to obtain the planned analytical data, as documented in this QAPP, are expected to provide comparable data.

3.0 SAMPLING PROCEDURES

Detailed descriptions of the sampling procedures to be used during the operation and maintenance period are described in the OM-LTP Plan.

4.0 SAMPLE CUSTODY

It is U.S. EPA and Region V policy to follow the "Policies and Procedures", EPA-330/9-78DDI-R, revised June 1985 or chain of custody protocols as described in Section 4.2 of this QAPP. The custody requirements are in three parts: sample collection, laboratory analysis, and final evidence files. Final evidence files, including all originals of laboratory reports and files, are maintained under document control in a secure area. A sample or evidence file is under document control if it:

- is in the possession of the Implementor;

- is in the view of a member of the Implementor after being in that member's possession;
- is in the Implementor's possession and is placed in a secure location; or
- is in a designated secure area.

4.1 Field Custody Procedures

The procedures for sample documentation, labeling, packaging and shipment summarized below will ensure that the samples arrive at the laboratory with the chain-of-custody intact. The Implementor's QA Officer will review all field custody documentation to assess whether appropriate procedures were followed during field work and include the findings of this assessment in the QA Reports (see Section 13.0).

Documentation - The field activities associated with the groundwater and surface water monitoring program will be documented in field logbooks. Information to be recorded in the logbooks includes basic site conditions, sequence and duration of events, data related to well installation, groundwater sampling and field measurements. Logbook entries will be described in as much detail as possible so that persons going to the site could re-construct a particular situation without reliance on memory.

Field logbooks will be bound field survey books or notebooks. Logbooks will be assigned to field personnel, but will be stored in a centralized secured location in the office when not in use. Each logbook will be identified with a project-specific control number. The title page of each logbook will contain the following:

- Name of person to whom it is assigned;
- Logbook number;
- Project name;
- Project start date; and
- Project end date.

Entries into the logbook will contain a variety of information. At the beginning of each entry, the date, start time, weather, names of all sampling team members present, level of personal protection being used and the signature of the person making the entry will be entered. The names of visitors to the site and the purpose of their visit will also be recorded in the field logbook.

Measurements made and samples collected will be recorded. All entries will be made in ink and no erasures will be made. If an incorrect entry is made, the information will be crossed out with a single strike mark, initialed and dated by the person making the entry. All equipment used to make measurements will be identified. A separate logbook will be dedicated specifically for recording instrument calibration and calibration check data.

Samples will be collected following the sampling procedures documented in the OM-LTP Plan. The equipment used to collect samples will be noted, along with the time of sampling, sample description, sample volume, and number of containers. Sample identification numbers will be assigned prior to sample collection. Field duplicate samples, which will receive an entirely separate sample identification number, will be noted under sample description.

Labeling -- All bottles will be identified with self-adhesive labels. The labels will show the project name, sample number, sample location, time and date of collection, collector initials and intended analysis (see Figure 1). Sample labels will be completed in waterproof ink unless prohibited by weather conditions. For example, a logbook notation would explain that a pencil was used to fill out the sample label because a labeling pen would not function in freezing weather.

Packaging and Shipment -- The sampling will be performed by personnel who will ship the samples directly to the laboratory within 24 hours of collecting the sample. The Field Team Leader will be personally responsible for the care and custody of the samples until they are shipped to the laboratories.

The samples will be packaged for shipment by placing each container in a separate zip-lock storage bag. The bags will then be placed in a cooler with sufficient packing material (i.e. bubble wrap, Styrofoam peanuts, etc) to adequately protect the containers from breakage, and with sufficient ice or other coolant materials to maintain the temperatures ($4^{\circ}C \pm 2^{\circ}C$) required for proper preservation of the samples.

Separate chain-of-custody forms (see Figure 2) will be completed for each cooler of samples. Properly completed chain-of-custody forms will show sample number, location, number and kind of containers, and intended analysis, along with the project name and signatures of the samplers. Each cooler will be closed and secured with strapping tape, and custody seals (see Figure 3) will be placed across the right-front and left-back of the cooler lid. When transferring the possession of samples, the individuals relinquishing and receiving the samples will sign, date and note the time on the chain-of-custody form.

4.2 Laboratory Custody Procedures

Laboratory custody procedures are described in the section titled "Sample Custody and Integrity" of GCAL's QAPP which is attached in Appendix I.

4.3 Final Evidence Files

Custody of the Implementor's final evidence files will be maintained at the on-site storage shed.

5.0 CALIBRATION PROCEDURES

This section describes procedures for maintaining the accuracy of all the instruments and measuring equipment, which are used for conducting field tests and laboratory analyses. These instruments and equipment will be calibrated prior to each use or on a scheduled, periodic basis.

5.1 Field Instruments

Calibration procedures for field instruments are specified in the field measurement SOPs contained in OM-LTP Plan.

5.2 Laboratory Instruments

Calibration procedures for laboratory instruments will be those specified in the CLP SOWs being used for this project (i.e., OLC02.1 and CLP SOW ILM04.0) and the laboratory SOPs.

6.0 ANALYTICAL PROCEDURES

6.1 Field Measurements

Reportable measurements of temperature, pH, conductivity, dissolved oxygen and turbidity will be performed in the field immediately upon sample collection. The analytical and field screening procedures for these field measurements are specified in the field measurement SOPs contained in the OM-LTP Plan.

6.2 Laboratory Analysis

The analytical procedures for laboratory testing for organics and inorganics will be CLP SOW (OLC02.1 and CLP SOW ILM04.0) and the laboratory SOPs.

7.0 DATA REDUCTION, VALIDATION, AND REPORTING

7.1 Field Data

Raw data from field measurements and sample collection activities will be appropriately recorded in the field logbooks. These data will be summarized in tabular form for attachment to the technical memoranda and project reports. Any further reduction of the data for evaluation purposes in the reports will be documented therein.

7.2 Laboratory Data

GCAL will perform in-house data reduction and validation in accordance with the section titled "Data Generation, Reduction, and Validation" (see Appendix I) of their written QAPP, the CLP SOWs being used for this project (i.e., OLC02.1 and CLP SOW ILM04.0). Data reporting by GCAL to the Implementor's QA Officer will also conform to the requirements of these SOWs and methods.

Analytical data received from the laboratories will be validated by the Implementor's QA officer in accordance with the following U.S. EPA guidance documents:

- USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review, October 1999.

- USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review, February 1994.

The Implementor's QA Officer will identify any out-of-control data points and data omissions and interact with the laboratory to correct data deficiencies. Decisions to repeat sample collection and/or analyses may be made by the Project Manager in conjunction with the U.S. EPA RPM based on the extent of the deficiencies and their importance in the overall context of the project.

8.0 INTERNAL QUALITY CONTROL CHECK

8.1 Field QC Checks

QC checks on potential impacts to precision and accuracy from sample collection will be assessed through collection and analysis of field duplicates and field blanks in accordance with the applicable procedures described above in Section 2.0.

QC checks for field measurement of temperature, pH, conductivity, dissolved oxygen and turbidity are limited to the following: (1) Checking the reproducibility of the measurement by obtaining multiple readings on a single sample/standard or location, and (2) by calibration of the instrument at the beginning of the day, and at the conclusion of the day's sampling or measurement efforts (or as needed based on site-specific requirements).

8.2 Laboratory Analysis

Two mechanisms will be used by the laboratories to ensure the reporting of analytical data of known and documented usable quality: 1) A formal written QAPP and 2) specific QC checks in accordance with that plan, and the applicable CLP SOWs and methods being used for this project (i.e., OLC02.1 and CLP SOW ILM04.0).

Laboratory QAPP

GCAL maintains a QAPP and QA program, the stated objective of which is to provide legally and scientifically valid laboratory services. The program directs organizational adherence to a system of mandatory operating practices and procedures which ensure that all generated laboratory data are scientifically correct, legally defensible, and fulfilling of applicable regulatory requirements.

QC Checks

The specific internal QC checks to be used by the laboratories include those specified in the CLP SOWs and in Appendices IV, V, and VI for the methods being used for this project (i.e., OLC02.1 and CLP SOW ILM04.0).

9.0 PERFORMANCE AND SYSTEM AUDITS

Performance and system audits of both field and laboratory activities will be conducted to verify that sampling and analysis are performed in accordance with the procedures established in the QAPP. The audits of field and laboratory activities include two separate independent parts: Internal and External audits.

9.1 Field Audits

Internal audits of field activities (sampling and measurements) will be conducted by the Implementor's QA Officer. The audits will include examination of field sampling records, field instrument operating records, sample collection, handling and packaging in compliance with the established procedures, maintenance of QA procedures, chain-of-custody, etc. These audits will occur at the onset of the project to verify that all established procedures are followed. Follow-up audits will be conducted to correct deficiencies and to verify that QA procedures are maintained throughout the maintenance and sampling activities. The audits will involve review of field measurement records, instrumentation calibration records and sample documentation.

External audits may be conducted by U.S. EPA Region V personnel at the discretion of the U.S. EPA RPM.

9.2 Laboratory Audits

Internal performance and system audits of the laboratories may be conducted by the Implementor's QA Officer. The systems audits, which would be done on an annual basis, would include an examination of laboratory documentation on sample receiving, sample log-in, sample storage, chain-of-custody procedures, sample preparation and analysis, instrument operating records, etc.

The performance audits may be conducted during this project. Blind QC samples may be prepared and submitted along with project samples to the laboratories for analysis throughout the project. The Implementor's QA Officer will evaluate the analytical results of these blind performance samples to ensure the laboratories maintains good performance.

External performance and system audits of the laboratories for approval/disapproval of their performance in the project may be conducted by the U.S. EPA Region V Field Services Section (FSS).

10.0 PREVENTATIVE MAINTENANCE

10.1 Field Instruments

The field instruments for this project include thermometers, pH meters, conductivity meters, dissolved oxygen meters and turbidity meters. The specific preventive maintenance procedures to be followed for field instruments are those recommended by the respective manufacturers. Internal preventative checks will be conducted at least monthly and will include reviewing the calibration and maintenance logs for each piece of equipment. In addition, the equipment will be turned on and tested to determine that it is functioning properly.
Field instruments will be checked and calibrated before they are shipped or carried to the field. These instruments will be checked and calibrated daily before use. Back-up instruments will be available on-site or within one-day shipment to avoid delays in the field schedule.

10.2 Laboratory Instruments

As part of their QA/QC Program, a routine preventive maintenance program is conducted by the laboratory to minimize the occurrence of instrument failure and other system malfunctions. GCAL will have internal groups to perform routine scheduled maintenance, and to repair or to coordinate with the vendor(s) for the repair of all instruments. Critical spare parts such as standards, reagents, columns, syringes, septum, GC/MS filament, will be kept on-site to minimize instrument down-time.

All laboratory instruments are maintained in accordance with manufacturer's specifications and the requirements of the specific analytical methods being used. The maintenance will be carried out on a regular scheduled basis, and will be documented in the laboratory instrument service logbook for each instrument. GCAL's specific maintenance procedures are outlined in the section titled "Preventive Maintenance" of their QAPP (Appendix I). Once the effluent laboratory has been selected, its specific maintenance procedures as defined in its QAPP will be attached to this QAPP, pending approval by the U.S. EPA.

11.0 DATA ASSESSMENT PROCEDURES

11.1 Field Data

Field data will be assessed for accuracy, precision, and completeness by the Implementor's QA Officer. Accuracy will be assessed using instrument-calibration and calibration-check data obtained on a daily basis. Precision will be assessed on the basis of reproducibility by comparing multiple readings from a single sample. At a minimum, multiple readings will be obtained every tenth measurement. Data completeness will describe the number of valid data measurements obtained as a percentage of the total number of data measurements planned.

11.2 Laboratory Data

All analytical data will be evaluated for precision, accuracy, completeness and sensitivity. The acceptability of the analytical precision and accuracy will be determined by comparing them to the control limits recommended in the CLP SOWs and methods being used for this project (i.e., OLC02.1 and CLP SOW ILM04.0). Data determined to be insufficiently precise or accurate will be subject to the corrective action prescribed by the appropriate analytical method. The QC samples used in the determination of precision and accuracy have been described in Section 8.0. Specific equations used to calculate precision, accuracy and completeness are presented below:

Precision will be expressed in terms of relative percent difference (RPD).

$$\text{RPD} = \frac{\left|\,|\text{Concentration 1 - Concentration 2}|\,\right|}{(\text{Concentration 1 + Concentration 2})/2} \times 100$$

Accuracy as determined from the analysis of an external reference standard will be expressed as percent recovery (%R).

$$\%\,\text{R} = \frac{\text{Measured Concentration}}{\text{Actual Concentration}} \times 100$$

Accuracy as determined from the analysis of a spiked sample will also be expressed percent recovery.

$$\%\,\text{R} = \frac{(\text{Spiked Sample Concentration - Sample Concentration})}{\text{Concentration of Spike Added}} \times 100$$

Completeness will describe the number of usable analytical results as a percentage of the total number of results expected for the samples submitted for analysis.

$$\%\ \text{Complete} = \text{Number of Usable Results} \times 100$$

Total Number of Results

Analytical sensitivity, or the achievement of method detection limits, depends on instrumental sensitivity and matrix effects. Thus, it is important to monitor instrumental sensitivity to ensure the data quality through constant instrument performance. The instrumental sensitivity will be monitored through the analysis of method blanks, calibration check samples and laboratory control samples.

12.0 CORRECTIVE ACTIONS

Corrective actions must be taken any time a situation develops that threatens data quality. Corrective action may be required if field or laboratory audits reveal unacceptable deviation from approved procedures. It may be required any time duplicate or spiked sample analyses exceed the QC limits or when blank analyses indicate unacceptable levels of contamination. Corrective actions for the field activities will be initiated as needed based on:

- A daily review of the implementation of the field activities by the Field Team Leader;
- A field sampling/data collection problem identified by a sampling team member;
- A daily review of the field data by the Field Team Leader; and/or
- A review of the field activities by other personnel.

Corrective actions will be initiated when:

- The field investigations are not implemented per the OM-LTP Plan;
- Site conditions require a modification to the identified sampling procedures in order to meet the Skinner Landfill DQOs;
- Equipment fails to properly operate in the field; and/or
- Field sampling and data collecting procedures warrant a corrective action.

The Implementor's QA Officer will approve corrective actions before implementation. Corrective actions will be initiated by the Field Team Leader and will be implemented by the appropriate personnel.

A corrective action may include immediate resampling and/or reanalysis of a few samples, or the cessation of all analyses with the subsequent resampling and/or reanalysis of all samples upon resolution of the problem.

Specific corrective actions for field measurements may include the following:

- Repeat the measurement to check the error;
- Check for all proper adjustments for ambient conditions such as temperature;
- Check the batteries;
- Check the calibration and adjust as necessary;

- Replace the instrument or measurement devices; and/or
- Stop work (if necessary).

Specific corrective actions for analytical measurements are described in the CLP SOWs being used for this project (i.e., OLC02.1 and CLP SOW ILM04.0) and the Laboratory QAPP. Corrective actions are required whenever an out-of-control event or potential out-of-control event is noted. The investigative action taken is somewhat dependent on the analysis and the event.

Laboratory personnel are alerted that corrective action may be necessary if:

- QC data are outside the warning or acceptable windows for precision and accuracy;
- Blanks contain target analytes above the acceptable levels;
- Undesirable trends are detected in spike recoveries or RPD between duplicates;
- There are unusual changes in detection limits;
- Deficiencies are detected by the Laboratory QA Departments during internal or external audits or from the results of performance evaluation samples; and/or
- Inquiries concerning data quality are received.

A QC problem that cannot be solved by immediate corrective action must be thoroughly investigated to determine the extent of the problem and to ensure that all samples affected by the problem are identified and analyzed.

13.0 QUALITY ASSURANCE REPORTS

Analytical data will be validated in accordance with the following U.S. EPA guidance documents:

- USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review, October 1999.
- USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review, February 1994.

Summary QA Reports will accompany the analytical results from the OM-LTP Plan sampling and analysis activities in a technical memorandum or project report when these are submitted to U.S. EPA. The QA Reports will include an assessment of data quality based on the QC data, results of any performance and system audits performed, as well as an account of any significant QA problems encountered and corrective action taken.

These QA reports will be generated for each for each sampling event. A separate report detailing project status, any significant QA proposed corrective action, and any changes in the QAPP or OM-LTP Plan will be generated by the QA Officer or his designee. The Implementor's QA Officer will be responsible for preparing the QA Reports. The QA reports and analytical data will be issued to the U.S. EPA RPM by the Implementor.

14.0 REFERENCES

USEPA, *Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans* (QAMS-005/80), EPA-600/4/83-004

USEPA, *EPA requirements for Quality Assurance Project Plans for Environmental Data Operation,* EPA QA/R-5, August 1994.

USEPA, Office of Emergency and Remedial Response, 1994, USEPA Contract Laboratory Program. *National Functional Guidelines for Inorganic Data Review.*

USEPA, Office of Emergency and Remedial Response, 1999, USEPA Contract Laboratory Program. *National Functional Guidelines for Organic Data Review.*

USEPA, *U.S. EPA Region V Model QAPjP,* 1991.

USEPA, *Model Mini-QAPjP,* 1993.

USEPA, *Policies and Procedures,* EPA-330/9-78DDI-R, revised June 1985.

Ohio EPA Division of Surface Water, *Primary Headwater Assessment Program Field Evaluation Manual,* June 2002.

FIGURES

GULF COAST
ANALYTICAL LABORATORIES, INC.

Preservative: None
Parameter:

Sample ID: ______________________________

Date: ______________ Time: ______________

Comp.: ______________ Grab: ______________

Sampled by: ______________________________
GCAL-01

Figure 1: Sample Label

GULF COAST
ANALYTICAL LABORATORIES, INC.
7979 GRSI Avenue
Baton Rouge, LA
70802-7402
(225) 769-4900 • Fax (225) 767-5717

Chain of Custody Record

Lab use only

Client Name	Client #	Group #	Due Date

Report to:	**Bill to:**
Client:	**Client:**
Address:	**Address:**
Contact:	**Contact:**
Phone:	**Phone:**
Fax:	**Fax:**

P.O. Number | **Project Name/Number**

Sampled By

Analytical Requests & Method

Lab use only:

Custody Seal

used ☐ yes ☐ no

in tact ☐ yes ☐ no

Temperature °C ______

Matrix[1]	Date	Time (2400)	Comp	Grab	Sample Description	Preservatives	No Containers												**Remarks:**	Lab ID

Turn Around Time: ☐ 24-48 hrs.* ☐ 3 days* ☐ 1 week* ☐ Standard ☐ Other ______

Relinquished by: (Signature)	**Received by: (Signature)**	**Date:**	**Time:**
Relinquished by: (Signature)	**Received by: (Signature)**	**Date:**	**Time:**
Relinquished by: (Signature)	**Received by: (Signature)**	**Date:**	**Time:**

Note: * Non-standard turnaround time request must be pre-scheduled with Laboratory.

Figure 2: Chain-of-Custody Form

By submitting these samples, you agree to the terms and conditions contained in our most recent schedule of services.

WHITE: CLIENT FINAL REPORT — CANARY: LABORATORY — PINK: CLIENT

GCAL-05 11/98

GULF COAST
ANALYTICAL LABORATORIES, INC.

CUSTODY SEAL

This package conforms to the conditions and limitations specified in 49 CFR 173.4

Date Sealed: ______________________________

Sealed by: ________________________________

GCAL-17

Figure 3: Custody Seal

APPENDIX I

ADMINISTRATIVE ORGANIZATION

Gulf Coast Analytical Laboratories is organized along clear lines of authority to provide our clients with service that is efficient and reliable. To assure communication between the departments, key personnel meet weekly, or more frequently as needed to discuss and coordinate the activities in the laboratory. The laboratory personnel also meet daily with project management to discuss key issues for that day.

It is the policy of the laboratory that at each management and operational level a designated deputy or deputies will maintain continuity of service and other functions in the event of absence of key staff.

Each department within the laboratory has specific roles and responsibilities in terms of producing a product of known quality. All laboratory personnel are expected to have a working knowledge of the Quality Assurance Program Plan.

The General Manager bears the primary responsibility for data quality at the laboratory. The General Manager directs the functional areas of marketing, finance and administration for the laboratory.

The Operations Manager is responsible for coordinating the activities of analysts and technicians. The Operations Manager assures the commitment of sufficient resources for the timely generation of data of a known quality. The technical operation of the laboratory is the responsibility of the Operations Manager.

The Technical Services Manager is responsible for coordinating the activities of the sample administration department, client services, and administrative support personnel.

The Information Technology Director manages the implementation and development of information technology tools. He is also responsible for the automated data collection systems used by the laboratory. He performs strategic planning for IT projects based on projected needs of the Laboratory. Interacts with clients to determine IT requirements such as electronic deliverables.

The QA/QC Director is responsible for the preparation and maintenance of the laboratory Quality Assurance Program Plan. The QA/QC Director acts as the official laboratory contact for audits, performance evaluation studies, and project-specific quality control issues. The QA/QC Director approves and confirms the implementation of corrective actions. The QA/QC Director is responsible for the approval and distribution of controlled documents. The QA/QC Director has the authority to intercede in all areas where quality related problems exist. No work will be released until the related quality deficiency has been corrected and approval has been given to proceed forward.

Department Supervisors are responsible for the overall flow of work and data through the laboratory. They are responsible for the maintenance of accurate SOP's. Further responsibilities include general management of all activities within their department, ensuring that all instrumentation and equipment meet performance criteria and calibration requirements, and training of laboratory staff. The Supervisor is responsible for validating data released from the department. Department Supervisors inform the Operations Manager or Technical

Services Manager of project status and capacity issues.

Project Managers act as liaisons between the laboratory and the client. Responsibilities include sample scheduling, communicating project-specific requirements to laboratory personnel, review of log-in summaries, notifying the client of any sample receipt or analytical problems, monitoring the progress of analytical work, and providing data to clients in a timely manner. Project Managers document client complaints.

At the bench level, analysts are responsible for the generation of data by analyzing samples according to written SOP's. They are also responsible for ensuring that all documentation related to the analysis is accurate and complete. The analyst should inform the Department Supervisor of quality problems immediately. The analysts have the authority to accept or reject data based on compliance with QC acceptance criteria. Analysts are responsible for initial review of all data.

The Data Validation Manager is responsible for review of final reports. Any discrepancies found in the data is reported to the appropriate Department Supervisor for review and correction if necessary.

Sample Custody and Integrity

GCAL utilizes a Laboratory Information Management System (LIMS) that was specifically developed for the needs of GCAL. The MULTI-LIMS, developed by Advanced Systems Management, Inc. tracks samples and analytical data throughout the laboratory. Results are available from the LIMS package in a variety of hard copy formats. Furthermore, computer terminals can be provided to clients who wish to view their data via modem. A built in security system prevents a client from viewing any data other than their own.

The following is an example of some of the information that is entered into the system:

1. Sample number (unique to this sample)
2. Job number (unique to this job or set of samples)
3. Date received
4. Time received
5. Date analytical results due
6. Sample description
7. Identifying marks
8. Customer's name
9. Customer's address
10. Group number
11. Storage location
12. Notation of any special handling instructions or priority assignments
13. Billing information - purchase orders
14. Analyses requested

The Sample Administration Department also maintains an electronic log of all samples received. The log includes basic information concerning the samples including; date of receipt, client, matrix and tests assigned. The information is stored with the final report.

GCAL understands that sample integrity is a vital part of Quality Assurance. Samples submitted to the laboratory should be logged in immediately. If there must be a delay in this process, log-in should be aware of those samples requiring refrigeration and store them accordingly. Any sample that is suspected of being contaminated, improperly stored or preserved, or improperly prepared, should be reported to the client immediately. Storage blanks located in the volatiles refrigerators are analyzed every two weeks. Records of these analyses are maintained in the GC and GC/MS Volatiles laboratories. No sample is analyzed if there is a question concerning its integrity.

After the sample analyses are complete and the final report is issued to the client, samples are held for 60 days from receipt before disposal. Samples may be held longer per the customer request. All customers are encouraged to take possession of their remaining sample after analysis.

Chain of Custody

A complete chain of custody is maintained by GCAL. Each sample when submitted to our laboratory is accompanied by a Chain of Custody form (Figure 3). These forms contain pertinent information about the sample including specific analytical requests, sampling notes, sample condition, customer name and address.

Additionally, information concerning the site name, field identification marks, date and time of collection, sampler signature, and preservation data is recorded.

Samples are tagged, preserved if necessary and stored appropriately (i.e. refrigerator, freezer or shelf). Samples to be analyzed for volatile organic compounds are stored in refrigerators located in the volatiles analytical laboratories.

Custody Transfer

If a sample requires additional work to be performed by a qualified outside laboratory, a chain of custody form is completed and submitted with a representative portion of the sample. A copy of this form is maintained on file along with similar information located in a logbook. The chosen laboratory must sign and date the form upon receipt and return it, along with any unused sample, upon completion of analysis.

PREVENTIVE MAINTENANCE

In order to prevent system down time, minimize corrective maintenance cost and to help insure data validity, GCAL uses a system of preventive maintenance.

Specific operator manuals are used to pinpoint steps in the preventive maintenance scheme for individual instruments. All routine maintenance is performed as recommended by the manufacturer. These manuals also assist in identification of commonly needed replacement parts so that an inventory of these parts can be properly maintained.

Maintenance contracts are purchased for most instruments. This insures periodic preventive maintenance visits by factory authorized service representatives and immediate service for corrective actions if required.

An instrument log, found in Appendix C, is associated with each instrument. Notation of the date and preventive maintenance activity is recorded when performed. This includes routine service checks by laboratory personnel as well as factory service calls. Instrumentation logs are periodically reviewed by the QA manager and the information contained in them is used to help identify long and short term equipment needs of the laboratory. This log also provides a written source for future use in preventive maintenance. A preventive maintenance SOP details the frequency and type of routine maintenance required for laboratory instrumentation.

Maintenance logs are also used for ovens, refrigerators, incubators, etc.. The log is to ensure that every facet in the operation of this lab is correctly documented.

Calibration curves, verification standards and internal standards insure that an instrument produces acceptable results. If calibration values do not conform to the expected results, calibration is repeated. An operator may perform routine maintenance at this point if problems persist. Some examples of these tasks would be the replacement of a nebulizer, adjusting an uptake level, cleaning a mixing chamber or replacing a column. Intensive maintenance is performed by authorized representatives of the instrument manufacturer.

All balances are serviced by an external certified service engineer semi-annually. Analytical balances are calibrated daily, using Class S weights. The Class S weights are recertified annually. Daily temperature logs are also kept for other instrumentation to insure reliable analytical data. All liquid-in-glass thermometers used for recording temperatures are calibrated against a NIST-traceable thermometer yearly. The calibration of dial-type thermometers and temperature probes are checked quarterly against a NIST-traceable thermometer. The barometer will be calibrated against an NIST-traceable barometer yearly.

When a piece of equipment is deemed defective, it is taken out of service and identified with an orange "OUT OF SERVICE" label. For support equipment such as balances, ovens, coolers, and pipettors, the QA/QC Department is notified so that proper servicing and repair can be scheduled. Routine and preventive maintenance for major instrumentation is performed by the analysts. If outside service is necessary, it is scheduled by the Department Supervisor with approval from the Operations Manager. Satisfactory instrument performance must be verified prior to returning to service any repaired equipment.

Data Generation, Reduction, and Validation

Initial data reduction is the responsibility of the analyst who performs the analysis and/or operates an instrument.

Each analyst records all manually generated data in a log book associated with the analysis or type of analysis being performed. The spike recoveries and precision for duplicates are calculated and recorded in the logbook. The analysts verifies that all sample identifications are accurate.

Data reduction includes all activities that convert instrument/computer responses into reportable results. This may involve calculations, compound identification, and QC sample calculations. Final results are obtained by direct reading from the instrument or calculations based on instrument readings, output, or responses. Manual data reduction is performed by calculating results with the appropriate formula. Manually entered information such as the sample ID is reviewed for accuracy on the hard copy. Computer data reduction requires that the analyst verify information used in final calculations is entered accurately. The analyst must also review the raw data for properly identified components, possible interferences, confirmation requirements, and acceptable readings for multiple integrations.

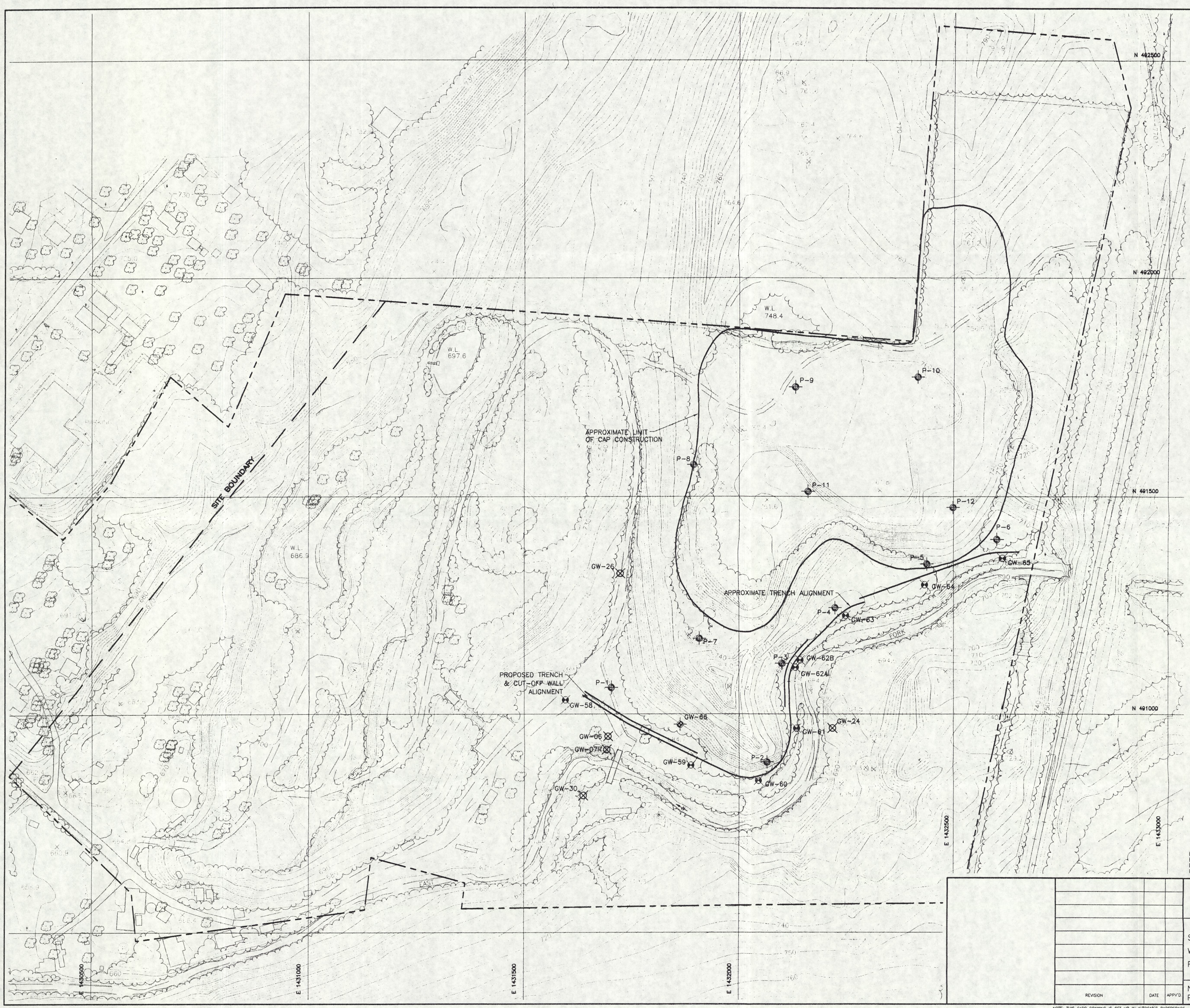
The analyst must verify that all data is accurately transcribed into a logbook or on a form. Organic final results are recorded on forms. Inorganic data is recorded in the logbooks. All data is manually posted in the LIMS.

Instrumentation run logs generated by the Unix/Target software for organic analysis are placed in a three ring binder which serves as the logbook for the applicable instruments. The run log identifies the file number for retrieving hard copy or electronic data. Other organic data run logs are documented in a logbook. The associated file number for retrieval of hard copy or electronic data is recorded. Additional information such as instrument ID, detector and column type, standard ID's, and other applicable information may also be recorded. Inorganic data results are entered in a logbook. The hard copy is retrievable based on the analytical date and time.
All raw data is maintained in files by the individual departments.

All associated quality control samples are documented or referenced in the logbooks along with the sample analytical data or a file number which represents the appropriate hard copy or electronic data. The recoveries are documented on the raw data or in the logbook.

Data validation is performed to check data integrity and to verify that the data is correct and of an acceptable quality. Data integrity involves reviewing all documentation for errors and mistakes. It includes review for correct documentation of sample ID's, verification that holding times were met, transcription errors, correct calculations, complete records, and for acceptable chain of custody documentation. A review of the data is performed to verify the results and to assure that all QC is within acceptable criteria. The Data is reviewed according to the criteria which applies to the particular analysis and according to the client specific project requirements. The reviewer will identify unacceptable data and initiate the appropriate corrective actions. The Department Supervisor or his representative will review the data entered into the LIMS. Validated data is released to the Report Generation Department. Hard copies of the final reports are reviewed by the Data Validation Department.

DRAWINGS



LEGEND

- EXISTING SPOT ELEVATION
- EXISTING CONTOUR LINES (DASHED UNDER VEGETATION)
- EXISTING EDGE OF WATER
- EXISTING TREE LINE
- EXISTING PAVED ROAD
- EXISTING UNPAVED ROAD
- EXISTING RAILROAD
- EXISTING FENCE
- EXISTING BUILDING
- EXISTING WALL
- EXISTING LIGHT POLE
- EXISTING POWER POLE
- EXISTING CULVERT
- EXISTING PROPERTY LINE
- SITE BOUNDARY LINE
- GW-24 GROUNDWATER MONITOR WELL LOCATION AND IDENTIFYING NUMBER
- GW-66 DNAPL WELL LOCATION AND IDENTIFYING NUMBER
- P-2 PIEZOMETER LOCATION AND IDENTIFYING NUMBER
- GW-24 EXISTING WELLS

THE FOLLOWING MONITOR WELLS WILL BE SAMPLED ALL OTHER WELLS & PIEZOMETERS WILL HAVE WATER LEVEL ELEVATIONS COLLECTED

GW-06	GW-62A
GW-07R	GW-62B
GW-58	GW-63
GW-59	GW-64
GW-60	GW-65
GW-61	

GRAPHIC SCALE

100 0 50 100 200 400

(IN FEET)
1 inch = 100 ft.

BASE MAP SOURCE:
BASE MAP WAS SUPPLIED BY WASTE MANAGEMENT OF OHIO, INC.. EXISTING TOPOGRAPHY WAS FLOWN AND DIGITIZED BY AERO-METRIC ENGINEERING AND MEETS NATIONAL MAP ACCURACY STANDARDS FOR TWO FOOT INTERVAL MAPPING. FIELD CHECKING OF THIS MAP IS RECOMMENDED BEFORE USE. FLIGHT DATE: 04/20/94.

REVISION	DATE	APPV'D.

RUST ENVIRONMENT & INFRASTRUCTURE

Skinner Landfill
West Chester, Butler County, Ohio
Remedial Action

NEW MONITOR WELL AND PIEZOMETER LOCATIONS

SCALE: 1"=100'	APPROVED BY:
DESIGNED BY:	DRAWN BY:
CHECKED BY:	DATE: JUNE 1996
FILE: SKWLMW01A00 DIR: \72680\800 PLOT DATE: 02/29/96 XREFS: 1 SCRIPTS:0	
PROJECT NO: 72680.800	
SHEET 2 OF 3	DRAWING NO: 2

NOTE: THIS CADD DRAWING IS SET UP IN AUTOCAD'S PAPERSPACE ALTERATIONS MAY BE NECESSARY FOR FILE TRANSLATION TO OTHER CADD PROGRAMS.

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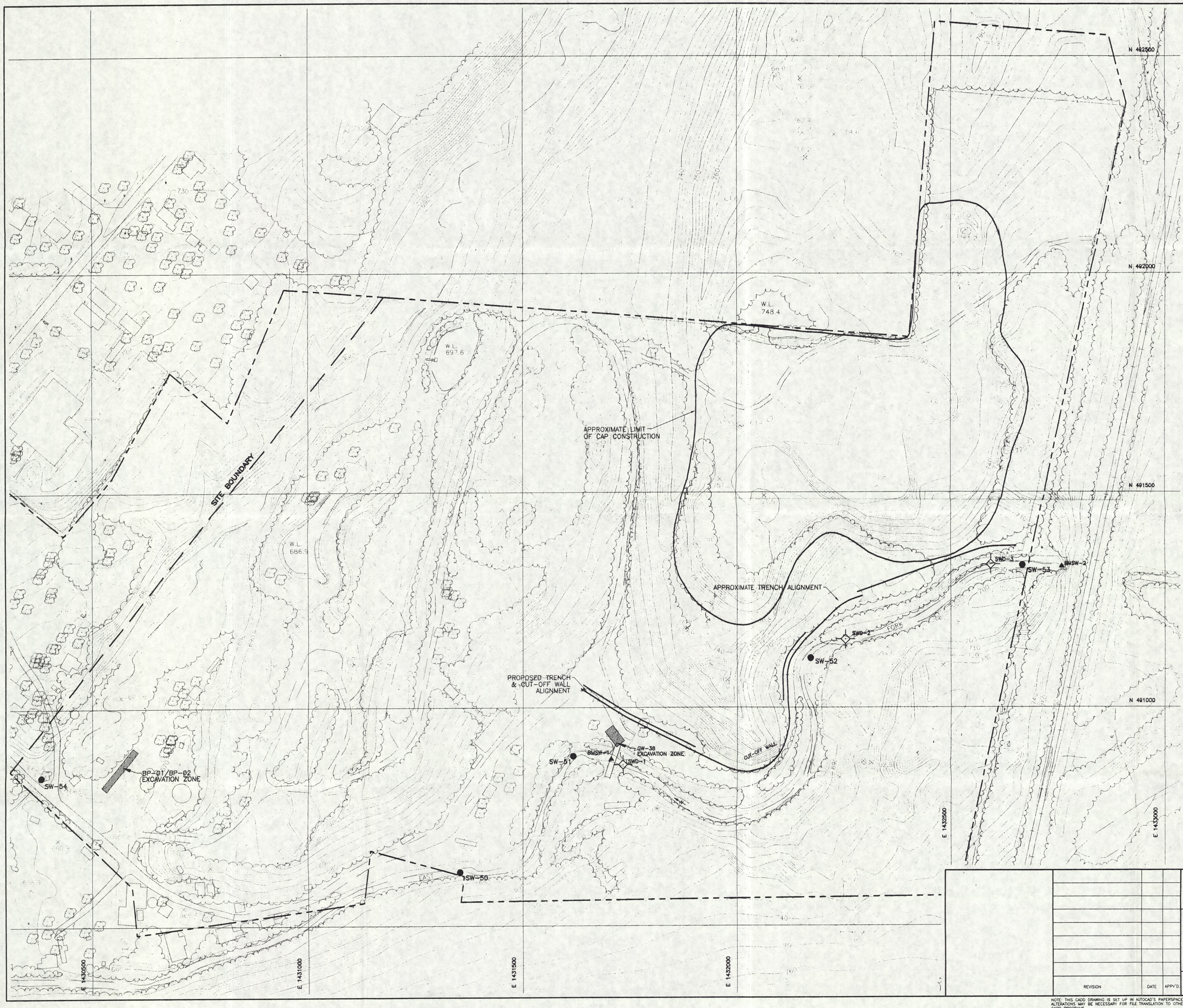

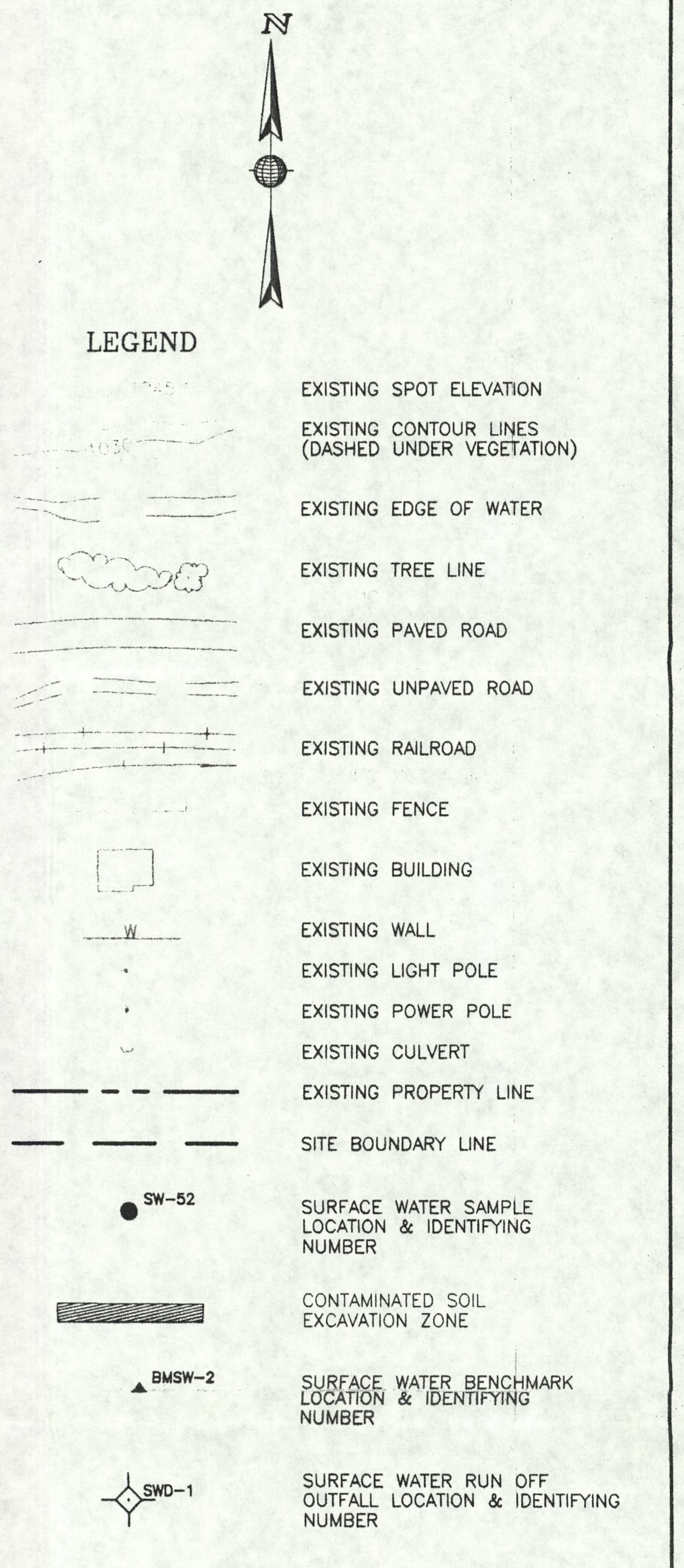

GRAPHIC SCALE

100 0 50 100 200 400

(IN FEET)
1 inch = 100 ft.

BASE MAP SOURCE:
BASE MAP WAS SUPPLIED BY WASTE MANAGEMENT OF OHIO, INC.. EXISTING TOPOGRAPHY WAS FLOWN AND DIGITIZED BY AERO-METRIC ENGINEERING AND MEETS NATIONAL MAP ACCURACY STANDARDS FOR TWO FOOT INTERVAL MAPPING. FIELD CHECKING OF THIS MAP IS RECOMMENDED BEFORE USE. FLIGHT DATE: 04/20/94.

REVISION	DATE	APPV'D.

RUST ENVIRONMENT & INFRASTRUCTURE

Skinner Landfill
West Chester, Butler County, Ohio
Remedial Action

RA IMPLEMENTATION
SURFACE WATER MONITOR LOCATIONS

SCALE: 1"=100'	APPROVED BY:
DESIGNED BY:	DRAWN BY:
CHECKED BY:	DATE: JUNE 1996
FILE: SKSWML01A00 DIR: \72680\800 PLOT DATE: 02/29/96 XREFS: 1 SCRIPTS:0	
PROJECT NO: 72680.800	
SHEET 3 OF 3	DRAWING NO: 3

NOTE: THIS CADD DRAWING IS SET UP IN AUTOCAD'S PAPERSPACE ALTERATIONS MAY BE NECESSARY FOR FILE TRANSLATION TO OTHER CADD PROGRAMS

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LEGEND

EXISTING SPOT ELEVATION
EXISTING CONTOUR LINES (DASHED UNDER VEGETATION)
EXISTING EDGE OF WATER
EXISTING TREE LINE
EXISTING PAVED ROAD
EXISTING UNPAVED ROAD
EXISTING RAILROAD
EXISTING FENCE
EXISTING BUILDING
W — EXISTING WALL
EXISTING LIGHT POLE
EXISTING POWER POLE
EXISTING CULVERT
EXISTING PROPERTY LINE
SITE BOUNDARY LINE
GW-24 — GROUNDWATER MONITOR WELL LOCATION AND IDENTIFYING NUMBER
GW-31 — GROUNDWATER MONITOR WELL LOCATION TO BE ABANDONED AND IDENTIFYING NUMBER

GRAPHIC SCALE

100 0 50 100 200 400

(IN FEET)
1 inch = 100 ft.

BASE MAP SOURCE:
BASE MAP WAS SUPPLIED BY WASTE MANAGEMENT OF OHIO, INC.. EXISTING TOPOGRAPHY WAS FLOWN AND DIGITIZED BY AERO-METRIC ENGINEERING AND MEETS NATIONAL MAP ACCURACY STANDARDS FOR TWO FOOT INTERVAL MAPPING. FIELD CHECKING OF THIS MAP IS RECOMMENDED BEFORE USE. FLIGHT DATE: 04/20/94.

REVISION	DATE	APPV'D.

RUST ENVIRONMENT & INFRASTRUCTURE

Skinner Landfill
West Chester, Butler County, Ohio
Remedial Action

EXISTING MONITOR WELL LOCATIONS AND WELLS TO BE ABANDONED

SCALE: 1"=100'	APPROVED BY:
DESIGNED BY:	DRAWN BY:
CHECKED BY:	DATE: JUNE 1996
FILE: SKABNDW1A00 PLOT DATE: 02/29/95	DIR: \72680\800 XREFS: 1 SCRIPTS:0
PROJECT NO: 72680.800	
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NOTE: THIS CADD DRAWING IS SET UP IN AUTOCAD'S PAPERSPACE ALTERATIONS MAY BE NECESSARY FOR FILE TRANSLATION TO OTHER CADD PROGRAMS.

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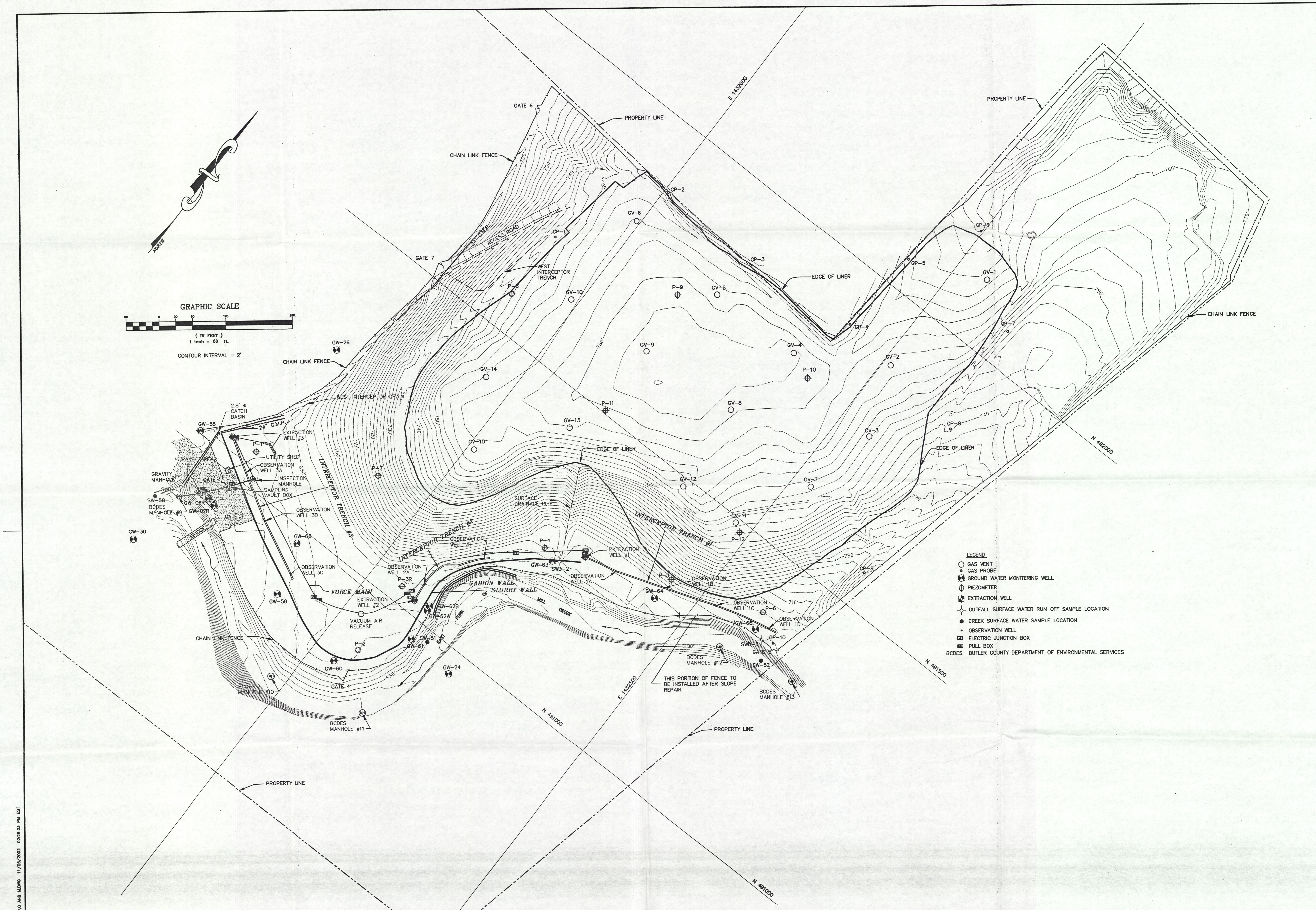

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NO.	REVISIONS	DATE	BY	CHK.
1	REVISIONS PER EARTH TECH	6/03	JLT	RFR

Burgess & Niple, Limited

CINCINNATI, OHIO BURGESS & NIPLE

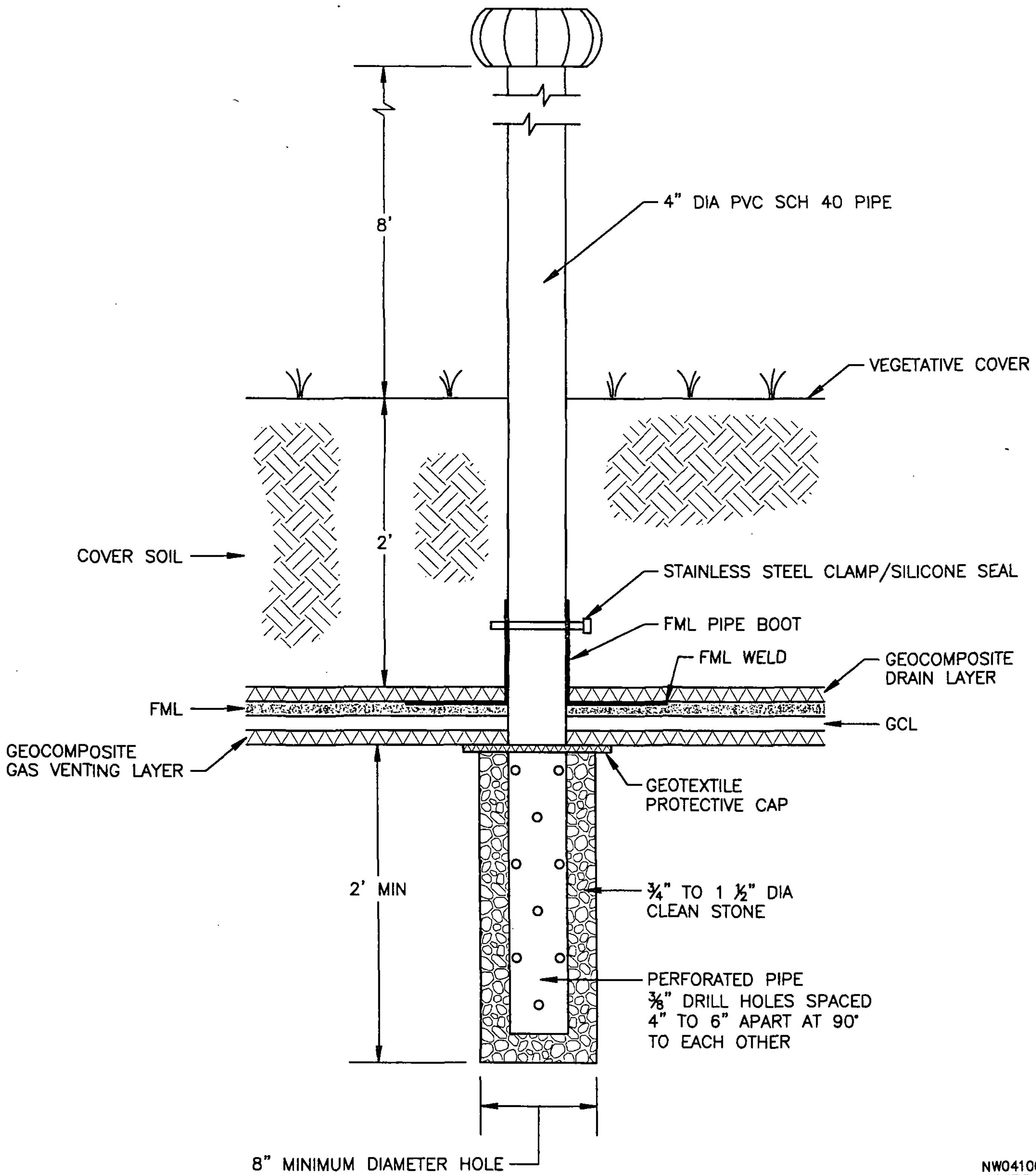
EARTH TECH
A TYCO INTERNATIONAL LTD. COMPANY

JOB NO.	30435
DESIGNED BY:	
DRAWN BY:	JLT
CHECKED BY:	RFR
APPROVED BY:	RFR
DATE:	6.11.03

SKINNER LANDFILL SUPERFUND SITE
OPERATION AND MAINTENANCE –
LONG TERM PERFORMANCE PLAN
SAMPLING/MONITORING LOCATIONS

SCALE: 1"= 60'

DRAWING 1



NW041002
GASVENT.DWG

DRAWING 2

SKINNER LANDFILL – SUPERFUND SITE
OPERATIONS AND MAINTENANCE – LONG TERM PERFORMANCE PLAN
GAS VENT DETAIL

38335.09

EARTH TECH